MATHEMATICS CONCEPTS & MATHEMATICS ITEMS

The *Mathematics Concepts and Mathematics Items* book contains the released TIMSS mathematics assessment items. These are the released items from the 1999 and 2003 assessments (as distinct from the secure items, which are kept confidential so that they may be used in subsequent cycles to monitor trends).

Guide to Using the *Mathematics Concepts and Mathematics Items* Materials

The materials contained in this book can be used in a number of ways as a tool to assist teachers in making a formative assessment of student knowledge and skills. Some of these ways include the following:

Teacher-designed formative assessments. A teacher might, for example, decide to examine how well his or her class can solve routine problems. In such a case, the first step would be to review the questions in *Mathematics Concepts and Mathematics Items*, selecting the ones of interest. Ready-to-use versions of these items can be found in the *Mathematics Items* book. Teachers can print these items or present them to students on an overhead. Student responses can be scored by referring to the appropriate page in *Mathematics Concepts and Mathematics Items*. Teachers can also compare the overall percentage of students responding correctly to the international benchmark for that item.

Feedback on teaching. To the extent that the items coincide with concepts taught, the teacher might follow the same process to gain rapid feedback on the success of the teaching episode.

Understanding misunderstandings. Again, a teacher might decide to examine the incorrect or partially correct responses of the class for insight into any general misunderstandings, with a view to re-teaching a particular topic or skill.

Identifying individual difficulties. In the same way, the teacher might use the items to identify particular difficulties experienced by individual students, as the basis for some remedial teaching or focused practice.

Guide to the Content and Layout of This Book

This book contains the released items from both TIMSS 1999 and TIMSS 2003. Due to slight revisions in terminology and released information between cycles, the format for the items in each cycle differs slightly. Each item appears on a single page and is accompanied by a number of descriptors.

1999 Content Domains:
- Fractions and number sense
- Algebra
- Measurement
- Geometry
- Data representation, analysis, and probability

2003 Content Domains:
- Algebra
- Data
- Geometry
- Measurement
- Number

1999 Cognitive Domains:
- Knowing
- Using routine procedures
- Investigating and problem solving
- Mathematical reasoning
- Communicating

2003 Cognitive Domains:
- Knowing facts and procedures
- Using concepts
- Solving routine problems
- Reasoning

Take a look at *Calories in a portion of food from ratio*, the name given to the first 1999 item in this book. As specified in boxes at the top of the page, the content domain for this item is *fractions and number sense* and the cognitive domain is *investigating and solving problems*. Looking at *Value of -3x given value of x*, the first item from TIMSS 2003 (page 85), the content domain (*algebra*) and the cognitive domain (*knowing facts and procedures*) are also accompanied by the Main Topic (*algebraic expressions*).

International item numbers identify each item. This number appears just below the item box.

Correct answers are shown beneath each item. These correct answers take two forms:

- **Letter code**. This form is used for the correct response on multiple-choice items. *Calories in a portion of food from ratio* provides an example of the letter code type—the correct answer is A.

- **Scoring guide**. This form is used to assist in scoring write-in responses. *Division of fractions* (J12) further along in the *Fractions and number sense* domain (page 13), provides an example of the scoring guide approach, indicating the general nature of correct and incorrect responses. In some cases, partial credit may be awarded and these items will provide guidelines for fully correct, partially correct, and incorrect responses.

Sample student responses are provided for TIMSS 2003 extended response items. An example of an actual U.S. eighth-grade student's response is provided for each scoring category. See item M032557 on page 89.

International benchmarks are provided in a table next to each item. These consist of statistics on the percentage of students in each country who answered the question correctly. The countries are ordered in terms of this percentage. The international average is included as well, and this display also indicates which countries scored significantly higher, significantly lower, and not significantly different from this international average.

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Calories in portion of food from ratio

If there are 300 calories in 100 g of a certain food, how many calories are there in a 30 g portion of this food?

A. 90

B. 100

C. 900

D. 1000

E. 9000

Item Number: B08

Overall Percent Correct

Country		
Singapore	90	▲
Korea, Rep. of	86	▲
Hong Kong, SAR	84	▲
Chinese Taipei	84	▲
Slovak Republic	78	▲
Malaysia	78	▲
Belgium (Flemish)	78	▲
Czech Republic	76	▲
Russian Federation	76	▲
Thailand	75	▲
Slovenia	75	▲
Cyprus	74	▲
Macedonia, Rep. of	74	O
Italy	74	▲
Moldova	73	O
Canada	73	▲
Hungary	73	O
Romania	72	O
Australia	72	O
Netherlands	71	O
Latvia (LSS)	70	O
England	70	O
International Average	**69**	
Tunisia	69	O
New Zealand	69	O
Bulgaria	68	O
United States	68	O
Turkey	66	O
Israel	66	O
Iran, Islamic Rep.	66	O
Finland	65	▼
Japan	63	▼
Chile	62	▼
Jordan	56	▼
Indonesia	56	▼
Lithuania	54	▼
Morocco	53	▼
Philippines	42	▼
South Africa	37	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**A**

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Complex Procedures

Figure showing equivalent fractions

Which picture shows that $\frac{2}{5}$ is equivalent to $\frac{4}{10}$?

A.

B.

C.

D.

Item Number: B09

Overall Percent Correct

Singapore	83	▲
Hong Kong, SAR	82	▲
Korea, Rep. of	81	▲
Japan	81	▲
Chinese Taipei	80	▲
Malaysia	76	▲
Belgium (Flemish)	74	▲
Canada	72	▲
Netherlands	69	▲
Slovenia	67	▲
Australia	65	▲
Finland	63	▲
United States	63	▲
Cyprus	62	O
Russian Federation	62	O
Thailand	61	O
England	60	O
Italy	60	O
Israel	59	O
Philippines	58	O
International Average	**58**	
New Zealand	58	O
Iran, Islamic Rep.	56	O
Moldova	54	O
Hungary	53	▼
Bulgaria	52	O
Slovak Republic	52	▼
Lithuania	51	▼
Jordan	49	▼
Latvia (LSS)	48	▼
Czech Republic	46	▼
Turkey	46	▼
Chile	46	▼
Indonesia	46	▼
Macedonia, Rep. of	45	▼
Romania	44	▼
Tunisia	33	▼
South Africa	29	▼
Morocco	23	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**A**

Content Domain	Cognitive Domain
Fractions and Number Sense	Knowing

Smallest decimal fraction

Which of these is the smallest number?

A. 0.625

B. 0.25

C. 0.375

D. 0.5

E. 0.125

Item Number: B10

Overall Percent Correct

Singapore	86	▲
Hong Kong, SAR	83	▲
Korea, Rep. of	82	▲
Netherlands	74	▲
Japan	73	▲
Finland	70	▲
Chinese Taipei	69	▲
Belgium (Flemish)	67	▲
Lithuania	61	▲
Canada	61	▲
Slovak Republic	60	▲
Czech Republic	59	▲
Malaysia	59	▲
Slovenia	58	▲
Australia	58	▲
Hungary	55	▲
Russian Federation	53	O
United States	51	O
Latvia (LSS)	49	O
Bulgaria	46	O
International Average	**46**	
England	45	O
Thailand	45	O
New Zealand	43	O
Italy	37	▼
Tunisia	34	▼
Morocco	31	▼
Moldova	31	▼
Israel	29	▼
Romania	28	▼
Cyprus	27	▼
Jordan	26	▼
Macedonia, Rep. of	25	▼
Chile	14	▼
Iran, Islamic Rep.	10	▼
Philippines	10	▼
Indonesia	9	▼
Turkey	9	▼
South Africa	6	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**E**

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Complex Procedures

Smallest simple fraction

Which of these fractions is smallest?

A. $\dfrac{1}{6}$

B. $\dfrac{2}{3}$

C. $\dfrac{1}{3}$

D. $\dfrac{1}{2}$

Item Number: D09

Overall Percent Correct

Hong Kong, SAR	93	▲
Singapore	90	▲
Japan	89	▲
Netherlands	87	▲
Finland	85	▲
Chinese Taipei	85	▲
Canada	83	▲
Korea, Rep. of	83	▲
Belgium (Flemish)	82	▲
Australia	80	▲
United States	76	▲
Slovenia	75	▲
New Zealand	75	▲
Israel	75	▲
Cyprus	73	▲
England	73	▲
Hungary	71	▲
Slovak Republic	67	O
Czech Republic	65	O
Malaysia	65	O
International Average	**62**	
Tunisia	61	O
Latvia (LSS)	61	O
Russian Federation	59	O
Bulgaria	59	O
Jordan	51	▼
Lithuania	50	▼
Romania	47	▼
Italy	46	▼
Macedonia, Rep. of	44	▼
Iran, Islamic Rep.	43	▼
Thailand	42	▼
Philippines	39	▼
Turkey	39	▼
Moldova	38	▼
Indonesia	38	▼
South Africa	28	▼
Morocco	25	▼
Chile	21	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response: A

Content Domain	Cognitive Domain
Fractions and Number Sense	Knowing

Estimate of point P on number line

What is the best estimate of the number corresponding to P?

A.   1.1

B.   1.2

C.   1.4

D.   1.5

Item Number: D12

Overall Percent Correct

Japan	93	▲
Singapore	91	▲
Finland	90	▲
Netherlands	90	▲
England	88	▲
Hong Kong, SAR	86	▲
Belgium (Flemish)	84	▲
Canada	84	▲
Australia	83	▲
Chinese Taipei	81	▲
United States	81	▲
Korea, Rep. of	81	▲
Slovak Republic	80	▲
Hungary	80	▲
New Zealand	80	▲
Malaysia	78	▲
Slovenia	78	▲
Latvia (LSS)	78	▲
Russian Federation	77	▲
Italy	68	O
International Average	**68**	
Czech Republic	65	O
Israel	64	O
Thailand	64	O
Bulgaria	63	O
Moldova	63	▼
Lithuania	61	▼
Turkey	59	▼
Chile	54	▼
Romania	53	▼
Jordan	53	▼
Philippines	51	▼
Macedonia, Rep. of	49	▼
Indonesia	46	▼
Cyprus	44	▼
Morocco	43	▼
Tunisia	40	▼
South Africa	38	▼
Iran, Islamic Rep.	32	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

Correct Response:	**B**

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Average speed from distance and time

A runner ran 3000 m in exactly 8 minutes. What was his average speed in meters per second?

A. 3.75

B. 6.25

C. 16.0

D. 37.5

E. 62.5

Item Number: F07

Overall Percent Correct

Singapore	67	▲
Chinese Taipei	61	▲
Hong Kong, SAR	60	▲
Japan	50	▲
Malaysia	47	▲
Russian Federation	45	▲
Belgium (Flemish)	44	▲
Korea, Rep. of	43	▲
Slovak Republic	42	▲
Bulgaria	41	O
Slovenia	41	▲
Netherlands	40	O
Hungary	40	▲
Lithuania	34	O
International Average	**33**	
Romania	33	O
Canada	32	O
Czech Republic	32	O
Turkey	30	O
Finland	30	O
Australia	29	O
Latvia (LSS)	29	O
Moldova	29	O
United States	28	▼
Thailand	28	▼
Indonesia	27	▼
Israel	27	▼
Tunisia	26	▼
Macedonia, Rep. of	26	▼
New Zealand	25	▼
Italy	25	▼
Cyprus	23	▼
England	22	▼
Jordan	19	▼
Iran, Islamic Rep.	19	▼
Chile	17	▼
Morocco	16	▼
South Africa	16	▼
Philippines	15	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**B**

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Complex Procedures

Number between two decimal fractions

Which of these numbers is between 0.07 and 0.08?

A. 0.00075

B. 0.0075

C. 0.075

D. 0.75

Item Number: F09

Overall Percent Correct

Singapore	87	▲
Netherlands	85	▲
Korea, Rep. of	84	▲
Belgium (Flemish)	84	▲
Japan	83	▲
Chinese Taipei	82	▲
Hong Kong, SAR	81	▲
Finland	80	▲
Canada	78	▲
Australia	76	▲
Slovenia	75	▲
Slovak Republic	74	▲
England	71	▲
Lithuania	71	▲
Czech Republic	70	▲
Malaysia	70	▲
United States	70	▲
Hungary	69	▲
Russian Federation	69	O
New Zealand	68	O
Bulgaria	67	O
Latvia (LSS)	66	O
International Average	**63**	
Italy	59	O
Israel	57	▼
Macedonia, Rep. of	56	▼
Moldova	56	▼
Thailand	54	▼
Cyprus	53	▼
Romania	52	▼
Tunisia	48	▼
Chile	42	▼
Indonesia	40	▼
Morocco	39	▼
Jordan	37	▼
Turkey	35	▼
Philippines	34	▼
South Africa	33	▼
Iran, Islamic Rep.	31	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**C**

Content Domain	Cognitive Domain
Fractions and Number Sense	Knowing

Fraction of circle shaded

What fraction of the circle is shaded?

A. Between 0 and $\frac{1}{4}$

B. Between $\frac{1}{4}$ and $\frac{1}{2}$

C. Between $\frac{1}{2}$ and $\frac{3}{4}$

D. Between $\frac{3}{4}$ and 1

Item Number: F12

Overall Percent Correct

Netherlands	75	▲
Belgium (Flemish)	73	▲
England	72	▲
Hong Kong, SAR	72	▲
Singapore	71	▲
Canada	68	▲
Australia	68	▲
New Zealand	64	▲
United States	62	▲
Chinese Taipei	61	▲
Japan	61	▲
Slovenia	59	▲
Finland	57	▲
Hungary	56	▲
Israel	54	O
Bulgaria	53	O
Czech Republic	51	O
Malaysia	50	O
Cyprus	50	O
International Average	**50**	
Korea, Rep. of	50	O
Russian Federation	50	O
Slovak Republic	49	O
Italy	48	O
Latvia (LSS)	44	O
Tunisia	43	▼
Jordan	40	▼
Romania	40	▼
Thailand	39	▼
Indonesia	39	▼
Moldova	34	▼
Morocco	33	▼
Iran, Islamic Rep.	32	▼
Chile	32	▼
Philippines	31	▼
Lithuania	31	▼
Turkey	28	▼
Macedonia, Rep. of	27	▼
South Africa	26	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Fractions and Number Sense	Knowing

Figure showing fraction of shaded square

Which shows $\frac{2}{3}$ of the square shaded?

A. B. C. D. E.

Item Number: H08

Overall Percent Correct

Singapore	96	▲
Belgium (Flemish)	94	▲
Hong Kong, SAR	94	▲
Netherlands	92	▲
Canada	91	▲
Japan	89	▲
Chinese Taipei	88	▲
Finland	87	▲
Korea, Rep. of	87	▲
Cyprus	87	▲
United States	86	▲
Malaysia	86	▲
Australia	85	▲
England	82	▲
New Zealand	80	▲
Hungary	78	▲
Slovenia	78	▲
Iran, Islamic Rep.	76	▲
Israel	73	O
Slovak Republic	72	O
Thailand	71	O
International Average	**68**	
Latvia (LSS)	66	O
Czech Republic	65	O
Italy	63	O
Russian Federation	61	O
Bulgaria	59	▼
Chile	57	▼
Jordan	54	▼
Turkey	53	▼
Macedonia, Rep. of	49	▼
Tunisia	48	▼
Philippines	46	▼
Lithuania	45	▼
Moldova	43	▼
Romania	41	▼
Indonesia	31	▼
South Africa	21	▼
Morocco	7	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	E

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Complex Procedures

Sum closest to 691 + 208

The sum 691 + 208 is closest to the sum

A. 600 + 200

B. 700 + 200

C. 700 + 300

D. 900 + 200

Item Number: H09

Overall Percent Correct

Singapore	97	▲
Belgium (Flemish)	96	▲
Japan	95	▲
Netherlands	95	▲
Hong Kong, SAR	93	▲
Canada	93	▲
United States	93	▲
Hungary	93	▲
Korea, Rep. of	93	▲
Slovenia	92	▲
England	92	▲
Czech Republic	91	▲
Australia	91	▲
Finland	91	▲
Slovak Republic	90	▲
Chinese Taipei	89	▲
New Zealand	88	▲
Malaysia	88	▲
Latvia (LSS)	87	▲
Bulgaria	86	▲
Cyprus	85	▲
Lithuania	84	O
Russian Federation	83	O
Israel	83	O
International Average	**80**	
Macedonia, Rep. of	79	O
Italy	77	O
Thailand	77	O
Turkey	74	▼
Romania	73	▼
Tunisia	67	▼
Jordan	66	▼
Moldova	66	▼
Chile	65	▼
Iran, Islamic Rep.	58	▼
Indonesia	54	▼
Philippines	53	▼
Morocco	43	▼
South Africa	37	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	B

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Routine Procedures

Division of fractions

Divide: $\dfrac{6}{55} \div \dfrac{3}{25} =$

Answer: _____

Item Number: J12

SCORING

Correct Response

• 10/11

• Other fractions or decimals equivalent to 10/11 *(e.g., 30/33, 150/165, .909, .91, etc.)*

Incorrect Response

• Any fraction with 2 as a numerator [Divides 6 by 3]

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Country	Percent	
Singapore	84	▲
Chinese Taipei	83	▲
Hong Kong, SAR	81	▲
Korea, Rep. of	80	▲
Japan	79	▲
Slovenia	74	▲
Russian Federation	72	▲
Bulgaria	72	▲
Slovak Republic	71	▲
Latvia (LSS)	68	▲
Hungary	66	▲
Romania	65	▲
Lithuania	64	▲
Italy	63	▲
Belgium (Flemish)	58	▲
Moldova	57	▲
Czech Republic	56	O
Malaysia	54	▲
International Average	**45**	
Turkey	41	O
Thailand	40	O
United States	37	▼
Iran, Islamic Rep.	34	▼
Canada	32	▼
Jordan	32	▼
Tunisia	29	▼
Chile	26	▼
Indonesia	24	▼
Macedonia, Rep. of	24	▼
Australia	23	▼
Israel	22	▼
Cyprus	21	▼
Finland	17	▼
Netherlands	12	▼
Philippines	11	▼
New Zealand	10	▼
South Africa	5	▼
England	4	▼
Morocco	4	▼

**Country average vs.
International average:**

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Routine Procedures

Division of decimals

Divide $0.003\overline{)15.45}$

A. 0.515

B. 5.15

C. 51.5

D. 515

E. 5150

Item Number: J14

Overall Percent Correct

Japan	70	▲
Slovak Republic	69	▲
Russian Federation	68	▲
Hong Kong, SAR	66	▲
Lithuania	65	▲
Chinese Taipei	64	▲
Hungary	63	▲
Korea, Rep. of	61	▲
Latvia (LSS)	54	▲
Slovenia	54	▲
Moldova	53	▲
Bulgaria	53	▲
Czech Republic	52	▲
Belgium (Flemish)	45	O
Singapore	45	O
Netherlands	44	O
Romania	40	O
International Average	**39**	
United States	39	O
Canada	39	O
Malaysia	39	O
Macedonia, Rep. of	38	O
Italy	36	O
Jordan	30	▼
Finland	29	▼
Cyprus	26	▼
Indonesia	24	▼
Israel	24	▼
Thailand	23	▼
New Zealand	21	▼
Tunisia	21	▼
Philippines	20	▼
Australia	20	▼
South Africa	19	▼
Chile	18	▼
England	16	▼
Turkey	15	▼
Iran, Islamic Rep.	14	▼
Morocco	14	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	E

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Complex Procedures

Distance between towns from map

On the map, 1 cm represents 10 km on the land.

Red River

Melville

Mockem

Folley

1 cm = 10 km

On the land, about how far apart are the towns Melville and Folley?

A.   5 km

B.   30 km

C.   40 km

D.   50 km

Item Number: J18

Overall Percent Correct

Japan	85	▲
Belgium (Flemish)	83	▲
Singapore	82	▲
Malaysia	77	▲
Lithuania	75	▲
Chinese Taipei	70	▲
Slovenia	70	▲
Netherlands	70	▲
Latvia (LSS)	68	▲
Russian Federation	68	▲
Czech Republic	67	O
Canada	65	▲
Hungary	65	O
Moldova	64	O
Bulgaria	64	O
Australia	64	O
Italy	63	O
England	62	O
Finland	61	O
Cyprus	61	O
Slovak Republic	61	O
Korea, Rep. of	60	O
New Zealand	58	O
International Average	**57**	
Thailand	56	O
Tunisia	54	O
Romania	51	O
Jordan	46	▼
Indonesia	44	▼
Israel	44	▼
Macedonia, Rep. of	43	▼
United States	40	▼
Iran, Islamic Rep.	37	▼
Turkey	35	▼
Chile	30	▼
South Africa	26	▼
Morocco	25	▼
Philippines	24	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**D**

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Complex Procedures

Length of building compared to car

The car is 3.5 m long. About how long is the building?

A.   18 m

B.   14 m

C.   10 m

D.   4 m

Item Number: L09

Overall Percent Correct

Singapore	91	▲
Malaysia	90	▲
Czech Republic	89	▲
Slovak Republic	88	▲
Hungary	88	▲
Russian Federation	88	▲
Finland	87	▲
Chinese Taipei	87	▲
Korea, Rep. of	87	▲
Lithuania	87	▲
Latvia (LSS)	86	▲
Belgium (Flemish)	85	▲
Japan	84	▲
Hong Kong, SAR	83	▲
Australia	83	▲
Bulgaria	83	▲
Netherlands	82	▲
Slovenia	82	O
Canada	79	O
New Zealand	78	O
England	76	O
Romania	76	O
Moldova	75	O
International Average	**75**	
Thailand	73	O
Italy	73	O
United States	72	O
Cyprus	71	O
Tunisia	70	O
Macedonia, Rep. of	69	O
Turkey	68	▼
Israel	68	▼
Iran, Islamic Rep.	61	▼
Chile	60	▼
Indonesia	59	▼
Jordan	56	▼
Morocco	43	▼
Philippines	40	▼
South Africa	26	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**B**

Content Domain	Cognitive Domain
Fractions and Number Sense	Knowing

Two hundred six and nine-tenths

Which number is two hundred six and nine-tenths?

A. 206.09

B. 206.9

C. 206.910

D. 2006.9

Item Number: L10

Overall Percent Correct

Hungary	97	▲
Russian Federation	93	▲
Slovak Republic	90	▲
Belgium (Flemish)	87	▲
Iran, Islamic Rep.	83	▲
Moldova	81	▲
United States	80	▲
Netherlands	79	▲
Korea, Rep. of	78	▲
Canada	77	▲
Czech Republic	75	▲
Jordan	75	▲
Lithuania	73	O
Turkey	72	▲
Singapore	72	O
Chinese Taipei	72	▲
Bulgaria	71	O
Romania	71	O
Finland	70	O
Hong Kong, SAR	68	O
Australia	67	O
Italy	66	O
International Average	**65**	
Israel	62	O
Japan	62	O
Slovenia	61	O
Chile	60	O
Malaysia	56	▼
Latvia (LSS)	55	O
Cyprus	54	▼
England	53	▼
New Zealand	53	▼
Tunisia	43	▼
Macedonia, Rep. of	42	▼
Philippines	42	▼
Morocco	41	▼
Thailand	40	▼
South Africa	31	▼
Indonesia	23	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	B

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Routine Procedures

Subtraction with three fractions

What is the value of $\dfrac{4}{5} - \dfrac{1}{3} - \dfrac{1}{15}$?

A. $\dfrac{1}{5}$

B. $\dfrac{2}{5}$

C. $\dfrac{7}{15}$

D. $\dfrac{3}{4}$

E. $\dfrac{4}{5}$

Item Number: L18

Overall Percent Correct

Singapore	87	▲
Chinese Taipei	81	▲
Korea, Rep. of	81	▲
Belgium (Flemish)	78	▲
Hong Kong, SAR	77	▲
Japan	75	▲
Malaysia	71	▲
Russian Federation	64	▲
Slovenia	63	▲
Slovak Republic	62	O
Hungary	60	O
Lithuania	58	O
Canada	57	O
Czech Republic	55	O
Netherlands	55	O
United States	55	O
International Average	**52**	
Indonesia	51	O
Finland	51	O
Thailand	51	O
Latvia (LSS)	50	O
Romania	50	O
Bulgaria	48	O
Australia	48	O
Cyprus	47	O
Israel	44	▼
Turkey	44	▼
Moldova	43	O
Italy	43	▼
New Zealand	41	▼
Jordan	40	▼
Macedonia, Rep. of	37	▼
Iran, Islamic Rep.	36	▼
Tunisia	36	▼
Philippines	35	▼
England	34	▼
Chile	32	▼
South Africa	23	▼
Morocco	16	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**B**

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Routine Procedures

Number of cars from rounded value

A company produced 17,175 cars in 1996. For a report, this number was rounded to the nearest hundred. Which was the number of cars given in the report?

A. 17,000

B. 17,100

C. 17,200

D. 17,270

Item Number: N11

Overall Percent Correct

Singapore	96	▲
Czech Republic	96	▲
Finland	94	▲
Slovenia	94	▲
Australia	94	▲
Belgium (Flemish)	93	▲
Hungary	93	▲
Slovak Republic	92	▲
Canada	92	▲
Netherlands	90	▲
United States	89	▲
Malaysia	89	▲
England	87	▲
New Zealand	86	▲
Bulgaria	86	▲
Hong Kong, SAR	86	▲
Chinese Taipei	82	▲
Korea, Rep. of	82	▲
Russian Federation	81	▲
Latvia (LSS)	80	O
Japan	79	▲
Lithuania	76	O
International Average	**74**	
Romania	72	O
Italy	72	O
Israel	72	O
Thailand	68	O
Macedonia, Rep. of	65	▼
Cyprus	64	▼
Indonesia	61	▼
Turkey	59	▼
Chile	58	▼
Jordan	55	▼
Philippines	51	▼
Moldova	49	▼
South Africa	38	▼
Tunisia	30	▼
Morocco	30	▼
Iran, Islamic Rep.	25	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Fractions and Number Sense	Knowing

List of equivalent fractions

In which list of fractions are all of the fractions equivalent?

A. $\dfrac{1}{2}$, $\dfrac{2}{4}$, $\dfrac{4}{6}$

B. $\dfrac{2}{3}$, $\dfrac{4}{6}$, $\dfrac{8}{12}$

C. $\dfrac{2}{5}$, $\dfrac{4}{10}$, $\dfrac{8}{50}$

D. $\dfrac{3}{4}$, $\dfrac{4}{6}$, $\dfrac{6}{8}$

Item Number: N14

Overall Percent Correct

Korea, Rep. of	86	▲
Chinese Taipei	85	▲
Hong Kong, SAR	84	▲
Singapore	84	▲
Belgium (Flemish)	83	▲
Japan	82	▲
Netherlands	74	▲
Canada	72	▲
Russian Federation	71	▲
Hungary	70	O
Bulgaria	68	O
Malaysia	68	O
Slovak Republic	67	O
Latvia (LSS)	66	O
Lithuania	66	O
Slovenia	65	O
Cyprus	64	O
United States	63	O
Australia	63	O
Finland	61	O
International Average	**61**	
Czech Republic	60	O
Israel	59	O
Italy	57	O
Thailand	57	O
Jordan	55	O
Romania	55	O
New Zealand	51	▼
England	51	▼
Moldova	50	▼
Iran, Islamic Rep.	49	▼
Tunisia	49	▼
Indonesia	48	▼
Turkey	45	▼
Macedonia, Rep. of	44	▼
Philippines	42	▼
Chile	41	▼
South Africa	34	▼
Morocco	32	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**B**

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Number of marbles in bag

Penny had a bag of marbles. She gave one-third of them to Rebecca, and then one-fourth of the remaining marbles to John. Penny then had 24 marbles left in the bag. How many marbles were in the bag to start with?

A. 36

B. 48

C. 60

D. 96

Item Number: N16

Overall Percent Correct

Singapore	81	▲
Japan	64	▲
Korea, Rep. of	64	▲
Chinese Taipei	60	▲
Hong Kong, SAR	60	▲
Netherlands	53	O
Finland	53	O
Belgium (Flemish)	52	O
New Zealand	49	O
Australia	48	O
Malaysia	47	O
England	46	O
Slovak Republic	45	O
Thailand	45	O
Canada	45	O
Hungary	45	O
Czech Republic	44	O
International Average	**44**	
Philippines	43	O
Bulgaria	43	O
Russian Federation	42	O
Israel	42	O
Moldova	41	O
Latvia (LSS)	41	O
United States	41	O
Slovenia	39	O
Romania	38	O
Turkey	38	O
Italy	38	O
Indonesia	37	O
Cyprus	36	O
Macedonia, Rep. of	35	▼
Morocco	34	▼
Jordan	33	▼
Tunisia	33	▼
Lithuania	32	▼
South Africa	31	▼
Iran, Islamic Rep.	31	▼
Chile	30	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**B**

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Amount of paint left

A painter had 25 L of paint. He used 2.5 L of paint every hour. He finished the job in 5.5 hours. How much paint did he have left?

A. 10.25 L

B. 11.25 L

C. 12.75 L

D. 13.75 L

Item Number: N17

Overall Percent Correct

Singapore	65	▲
Chinese Taipei	63	▲
Hong Kong, SAR	56	▲
Malaysia	54	▲
Korea, Rep. of	53	▲
Netherlands	49	▲
Japan	47	▲
Czech Republic	43	O
Hungary	40	O
Bulgaria	39	O
Russian Federation	39	O
Lithuania	39	O
Belgium (Flemish)	39	O
Slovak Republic	39	O
Canada	36	O
Slovenia	36	O
International Average	**35**	
United States	35	O
Finland	34	O
Cyprus	33	O
Australia	32	O
Latvia (LSS)	31	O
Turkey	29	O
Romania	29	O
Moldova	29	O
New Zealand	29	O
Macedonia, Rep. of	28	O
Italy	27	O
England	27	O
Tunisia	26	▼
Israel	25	▼
Iran, Islamic Rep.	25	▼
Morocco	23	▼
Indonesia	22	▼
Chile	22	▼
Jordan	21	▼
Philippines	20	▼
South Africa	18	▼

Country average vs. International average:
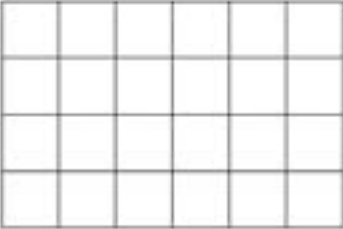
Higher	▲
Not different	O
Lower	▼

Correct Response:	B

Content Domain	Cognitive Domain
Fractions and Number Sense	Knowing

Shade in 3/8 of squares in grid

Shade in $\frac{3}{8}$ of the unit squares in the grid.

Item Number: N19

SCORING

Correct Response
- 9 squares are shaded (regardless of which squares)
- Other correct *(e.g., 6 full squares and 6 half squares shaded or other equivalent of nine squares)*

Incorrect Response
- 3 squares shaded
- 8 squares shaded
- 11 or 13 squares shaded
- 3 squares shaded and 8 more squares shaded (areas are shaded separately)
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Country		
Singapore	89	▲
Hong Kong, SAR	87	▲
Belgium (Flemish)	87	▲
Korea, Rep. of	81	▲
Chinese Taipei	80	▲
Japan	78	▲
Malaysia	73	▲
Canada	68	▲
Finland	65	▲
Hungary	63	▲
Netherlands	61	O
Australia	60	▲
Slovenia	55	O
Bulgaria	54	O
Cyprus	54	O
England	52	O
Slovak Republic	52	O
Russian Federation	52	O
United States	49	O
International Average	**49**	
Thailand	49	O
New Zealand	46	O
Italy	46	O
Latvia (LSS)	46	O
Moldova	44	O
Czech Republic	42	O
Israel	40	▼
Romania	39	▼
Macedonia, Rep. of	32	▼
Jordan	31	▼
Iran, Islamic Rep.	31	▼
Tunisia	28	▼
Turkey	26	▼
Lithuania	26	▼
Indonesia	21	▼
Chile	13	▼
Philippines	11	▼
Morocco	8	▼
South Africa	7	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Complex Procedures

Estimate of total cars in parking lot

There are 68 rows of cars in a parking lot. Each row has 92 cars. Which of these would give the closest estimate of the total number of cars in the parking lot?

A. 60 x 90 = 5400

B. 60 x 100 = 6000

C. 70 x 90 = 6300

D. 70 x 100 = 7000

Item Number: P13

Overall Percent Correct

Singapore	94	▲
Hong Kong, SAR	85	▲
Belgium (Flemish)	83	▲
Japan	82	▲
Korea, Rep. of	82	▲
Chinese Taipei	81	▲
Netherlands	81	▲
Finland	79	▲
United States	79	▲
Slovak Republic	78	▲
Hungary	78	▲
Canada	78	▲
Czech Republic	78	▲
Malaysia	78	▲
Australia	77	▲
Slovenia	76	▲
England	74	▲
New Zealand	67	O
Russian Federation	65	O
International Average	**65**	
Israel	63	O
Latvia (LSS)	62	O
Cyprus	60	O
Bulgaria	60	O
Thailand	58	O
Jordan	58	O
Lithuania	57	O
Romania	55	O
Macedonia, Rep. of	53	▼
Italy	52	▼
Moldova	52	▼
Turkey	50	▼
Chile	48	▼
Tunisia	48	▼
Iran, Islamic Rep.	48	▼
Indonesia	44	▼
Philippines	42	▼
South Africa	30	▼
Morocco	17	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Estimate of distance from explosion

Sound travels at approximately 330 meters per second. The sound of an explosion took 28 seconds to reach a person. Which of these is the closest estimate of how far away the person was from the explosion?

A. 12,000 m

B. 9,000 m

C. 8,000 m

D. 6,000 m

Item Number: P14

Overall Percent Correct

Singapore	83	▲
Japan	81	▲
Korea, Rep. of	78	▲
Hong Kong, SAR	78	▲
Chinese Taipei	77	▲
Slovak Republic	76	▲
Slovenia	71	▲
Czech Republic	71	▲
Malaysia	70	▲
Belgium (Flemish)	69	▲
Canada	64	▲
Netherlands	63	O
Finland	63	O
United States	63	▲
Australia	62	O
Lithuania	62	O
Hungary	61	O
Russian Federation	59	O
Thailand	59	O
International Average	**56**	
Bulgaria	55	O
Italy	52	O
Latvia (LSS)	52	O
Israel	51	O
Turkey	50	O
Cyprus	50	O
New Zealand	50	O
England	50	O
Macedonia, Rep. of	47	▼
Moldova	45	▼
Philippines	43	▼
Jordan	42	▼
Tunisia	42	▼
Indonesia	41	▼
Romania	40	▼
Iran, Islamic Rep.	38	▼
Chile	37	▼
South Africa	21	▼
Morocco	13	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	B

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Fraction of cherries in basket

Robin and Jim took cherries from a basket. Robin took $\frac{1}{3}$ of the cherries and Jim took $\frac{1}{6}$ of the cherries. What fraction of the cherries remained in the basket?

A. $\frac{1}{2}$

B. $\frac{1}{3}$

C. $\frac{1}{6}$

D. $\frac{1}{18}$

Item Number: P15

Overall Percent Correct

Singapore	85	▲
Hong Kong, SAR	75	▲
Chinese Taipei	68	▲
Belgium (Flemish)	62	▲
Japan	62	▲
Netherlands	61	▲
Cyprus	56	▲
Malaysia	55	▲
Korea, Rep. of	55	▲
Hungary	55	▲
Canada	53	▲
United States	52	O
Russian Federation	51	O
Australia	51	O
Slovenia	51	O
Latvia (LSS)	49	O
Finland	48	O
Slovak Republic	48	O
Romania	47	O
Lithuania	46	O
International Average	**45**	
Moldova	44	O
Czech Republic	43	O
Israel	43	O
New Zealand	43	O
Bulgaria	43	O
England	42	O
Macedonia, Rep. of	38	O
Jordan	34	▼
Indonesia	34	▼
Italy	32	▼
Iran, Islamic Rep.	32	▼
Turkey	32	▼
Tunisia	31	▼
Thailand	29	▼
Philippines	22	▼
Chile	22	▼
South Africa	18	▼
Morocco	14	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	A

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Routine Procedures

Write decimal as fraction

Write 0.48 as a fraction reduced to its lowest terms.

Answer: _____

Item Number: P17

SCORING

Correct Response

• 12/25

Incorrect Response

• 48/100 OR 24/50

• Any fraction other than 48/100 with 48 as numerator

• Any fraction with 48 as denominator

• 4/8 OR 2/4 OR 1/2

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Singapore	87	▲
Korea, Rep. of	78	▲
Hong Kong, SAR	74	▲
Chinese Taipei	71	▲
Japan	65	▲
Belgium (Flemish)	56	▲
Moldova	55	▲
Canada	50	▲
Slovenia	48	▲
United States	46	▲
Iran, Islamic Rep.	43	▲
Bulgaria	42	O
Australia	42	O
Slovak Republic	42	O
Russian Federation	42	O
Romania	41	O
Malaysia	40	O
Hungary	40	O
International Average	**36**	
Tunisia	34	O
Netherlands	31	O
Czech Republic	30	O
Latvia (LSS)	28	O
Italy	25	▼
Israel	24	▼
Turkey	24	▼
Thailand	24	▼
Lithuania	24	▼
New Zealand	23	▼
Cyprus	22	▼
Jordan	22	▼
Indonesia	22	▼
Finland	19	▼
England	18	▼
Macedonia, Rep. of	13	▼
Philippines	12	▼
Chile	11	▼
South Africa	4	▼
Morocco	3	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Routine Procedures

Subtraction of decimals to 0.001

Subtract: $4.722 - 1.935 =$

A. 2.787

B. 2.797

C. 2.887

D. 2.897

Item Number: R07

Overall Percent Correct

Malaysia	92	▲
Singapore	90	▲
Hungary	90	▲
Slovenia	90	▲
Korea, Rep. of	88	▲
Russian Federation	88	▲
Slovak Republic	87	▲
Japan	86	▲
Lithuania	86	▲
Czech Republic	85	O
Chinese Taipei	84	▲
Hong Kong, SAR	83	▲
Thailand	83	▲
Tunisia	82	O
Bulgaria	81	O
Moldova	80	O
Canada	80	O
Latvia (LSS)	79	O
Indonesia	78	O
Romania	77	O
United States	77	O
Italy	77	O
International Average	**77**	
Chile	75	O
Australia	74	O
Belgium (Flemish)	73	O
Finland	72	O
Cyprus	71	O
Macedonia, Rep. of	71	O
Iran, Islamic Rep.	71	O
Turkey	71	O
Netherlands	69	O
Philippines	69	▼
Jordan	65	▼
Israel	63	▼
Morocco	62	▼
New Zealand	61	▼
England	59	▼
South Africa	42	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**A**

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Complex Procedures

Average weight of salt crystals

The total weight of a pile of 500 salt crystals is 6.5 g. What is the average weight of a salt crystal?

A. 0.0078 g

B. 0.013 g

C. 0.0325 g

D. 0.078 g

Item Number: R08

Overall Percent Correct

Hong Kong, SAR	75	▲
Chinese Taipei	75	▲
Singapore	74	▲
Japan	73	▲
Korea, Rep. of	72	▲
Hungary	67	▲
Slovak Republic	66	▲
Russian Federation	65	▲
Malaysia	64	▲
Belgium (Flemish)	63	▲
Lithuania	57	O
Slovenia	57	O
Netherlands	57	O
Bulgaria	55	O
Moldova	54	O
Finland	54	O
International Average	**52**	
Romania	52	O
Czech Republic	50	O
Chile	49	O
Canada	49	O
Tunisia	48	O
Turkey	48	O
Latvia (LSS)	47	O
Macedonia, Rep. of	47	O
Australia	47	O
Indonesia	46	O
Italy	45	O
Thailand	44	▼
United States	44	▼
New Zealand	43	▼
Jordan	41	▼
England	40	▼
Israel	40	▼
Iran, Islamic Rep.	36	▼
Morocco	35	▼
South Africa	35	▼
Cyprus	31	▼
Philippines	29	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	B

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Routine Procedures

Subtraction of 4-digit whole numbers

Subtract:
$$\begin{array}{r} 7003 \\ -\ 4078 \\ \hline \end{array}$$

A. 2035

B. 2925

C. 3005

D. 3925

Item Number: R13

Overall Percent Correct

Malaysia	94	▲
Singapore	92	▲
Chinese Taipei	90	▲
Hong Kong, SAR	90	▲
Korea, Rep. of	88	▲
Hungary	87	▲
Slovak Republic	86	▲
Japan	86	▲
Belgium (Flemish)	85	▲
Slovenia	83	▲
Canada	83	▲
Czech Republic	82	O
United States	81	▲
Lithuania	80	O
Tunisia	80	▲
Russian Federation	79	O
Moldova	79	O
Netherlands	79	O
Australia	77	O
Thailand	77	O
Finland	76	O
Bulgaria	76	O
International Average	**74**	
Latvia (LSS)	74	O
Iran, Islamic Rep.	73	O
Cyprus	70	O
Turkey	69	O
Jordan	69	O
Romania	68	O
Israel	67	O
Italy	67	O
Macedonia, Rep. of	65	▼
Chile	59	▼
Philippines	58	▼
New Zealand	58	▼
Indonesia	55	▼
Morocco	54	▼
England	51	▼
South Africa	37	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	B

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

How much money left if spent 5/8

Laura had \$240. She spent $\dfrac{5}{8}$ of it. How much money did she have left?

Answer: _____

Item Number: R14

SCORING

Note: There is no distinction made between responses with and without units.

Correct Response

• 90

Incorrect Response

• 150 [money spent]

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Singapore	78	▲
Hong Kong, SAR	66	▲
Malaysia	59	▲
Japan	50	▲
Korea, Rep. of	50	▲
Chinese Taipei	49	▲
Finland	48	▲
Netherlands	47	▲
Belgium (Flemish)	45	▲
Hungary	40	▲
Moldova	38	O
Australia	37	O
Slovenia	35	O
Slovak Republic	33	O
Cyprus	33	O
Canada	30	O
Czech Republic	30	O
International Average	**30**	
Bulgaria	27	O
Russian Federation	27	O
United States	25	▼
Italy	24	O
New Zealand	24	O
England	24	O
Latvia (LSS)	24	O
Israel	23	O
Tunisia	22	▼
Romania	21	▼
Thailand	21	▼
Iran, Islamic Rep.	20	▼
Lithuania	19	▼
Turkey	17	▼
Macedonia, Rep. of	14	▼
Jordan	14	▼
Indonesia	11	▼
Chile	6	▼
Philippines	4	▼
South Africa	3	▼
Morocco	1	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Money from total magazine sales

John sold 60 magazines and Mark sold 80 magazines. The magazines were all sold for the same price. The total amount of money received for the magazines was $700. How much money did Mark receive?

Answer: _____

Item Number: R15

SCORING

Note: There is no distinction made between responses with and without units.

Correct Response

• 400

Incorrect Response

• 500 [price per magazine x 100]

• 350 [700 ÷ 2]

• 300 [money John received]

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Country	Percent	
Singapore	84	▲
Chinese Taipei	75	▲
Hong Kong, SAR	72	▲
Korea, Rep. of	69	▲
Japan	67	▲
Malaysia	65	▲
Slovenia	60	▲
Belgium (Flemish)	60	▲
Hungary	58	▲
Moldova	54	▲
Czech Republic	54	O
Slovak Republic	54	O
Lithuania	54	▲
Netherlands	53	O
Russian Federation	52	O
Bulgaria	50	O
Latvia (LSS)	48	O
Finland	47	O
Canada	46	O
International Average	**44**	
Australia	44	O
Romania	43	O
United States	41	O
Cyprus	40	O
Tunisia	39	O
Thailand	38	O
Italy	36	O
New Zealand	33	▼
England	31	▼
Israel	30	▼
Macedonia, Rep. of	30	▼
Iran, Islamic Rep.	28	▼
Indonesia	27	▼
Turkey	26	▼
Jordan	23	▼
Chile	22	▼
Philippines	12	▼
South Africa	9	▼
Morocco	3	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Number/fraction of 2 types of boxes

A book publisher sent 140 copies of a certain book to a bookstore. The publisher packed the books in two types of boxes. One type of box held 8 copies of the book, and the other type of box held 12 copies of the book. The boxes were all full, and there were equal numbers of both types of boxes.

a) How many boxes holding 12 books were sent to the bookstore?

Answer: _____

b) What fraction of the books sent to the bookstore were packed in the smaller boxes?

Answer: _____

Item Number: T02A

Overall Percent Correct

Country		
Singapore	62	▲
Chinese Taipei	60	▲
Korea, Rep. of	59	▲
Japan	58	▲
Hong Kong, SAR	58	▲
Belgium (Flemish)	43	▲
Bulgaria	33	O
Malaysia	33	▲
Finland	32	O
Australia	32	▲
Netherlands	32	O
Hungary	31	▲
Canada	31	▲
Slovenia	31	O
Latvia (LSS)	29	O
Russian Federation	29	O
United States	26	O
International Average	**26**	
Slovak Republic	25	O
England	24	O
Moldova	24	O
New Zealand	24	O
Romania	22	O
Czech Republic	22	O
Lithuania	22	O
Thailand	19	▼
Israel	18	▼
Italy	18	▼
Cyprus	15	▼
Jordan	12	▼
Indonesia	10	▼
Turkey	9	▼
Tunisia	8	▼
Macedonia, Rep. of	8	▼
Iran, Islamic Rep.	7	▼
Chile	4	▼
Philippines	2	▼
South Africa	2	▼
Morocco	1	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

SCORING

A: Scoring for Total Number of Boxes

Correct Response

• 7

Incorrect Response

• Incorrect (including crossed out/erased, stray marks, illegible, or off task)

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Number/fraction of 2 types of boxes

A book publisher sent 140 copies of a certain book to a bookstore. The publisher packed the books in two types of boxes. One type of box held 8 copies of the book, and the other type of box held 12 copies of the book. The boxes were all full, and there were equal numbers of both types of boxes.

a) How many boxes holding 12 books were sent to the bookstore?

Answer: _____

b) What fraction of the books sent to the bookstore were packed in the smaller boxes?

Answer: _____

Item Number: T02B

SCORING

B: Scoring for Fraction of Books in Smaller Boxes

Note: The term "equivalent" in the scoring guide below includes decimal fractions and percentages.

Correct Response
- 2/5
- Another fraction or percent equivalent to 2/5 *(e.g., 8/20, 14/35, 28/70, etc.)*
- Other correct

Incorrect Response
- 1/2
- 2/3 OR 8/12 OR 56/84 [fraction of boxes]
- Any integer
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Singapore	48	▲
Hong Kong, SAR	43	▲
Chinese Taipei	43	▲
Japan	32	▲
Korea, Rep. of	30	▲
Bulgaria	18	O
Malaysia	16	O
Russian Federation	15	O
Canada	14	O
Netherlands	13	O
Hungary	13	O
Australia	12	O
International Average	**12**	
Slovenia	11	O
United States	11	O
Slovak Republic	11	O
Romania	10	O
Belgium (Flemish)	10	O
Thailand	10	O
New Zealand	10	O
Moldova	10	O
England	9	O
Finland	8	▼
Czech Republic	8	▼
Latvia (LSS)	8	▼
Cyprus	7	▼
Italy	6	▼
Israel	5	▼
Lithuania	4	▼
Jordan	3	▼
Iran, Islamic Rep.	2	▼
Indonesia	2	▼
Macedonia, Rep. of	2	▼
Chile	2	▼
Turkey	2	▼
Tunisia	1	▼
Philippines	1	▼
South Africa	1	▼
Morocco	0	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Height of stack from paper thickness

A sheet of paper is 0.012 cm thick. Of the following, which would be the height of a stack of 400 sheets of this paper?

A. 0.048 cm

B. 0.48 cm

C. 4.8 cm

D. 48 cm

Item Number: T04

Overall Percent Correct

Japan	83	▲
Singapore	80	▲
Hong Kong, SAR	78	▲
Chinese Taipei	75	▲
Korea, Rep. of	75	▲
Belgium (Flemish)	75	▲
Netherlands	72	▲
Finland	72	▲
Czech Republic	70	▲
Slovak Republic	69	▲
Malaysia	67	▲
Canada	67	▲
Hungary	65	▲
Slovenia	62	▲
United States	62	▲
Australia	59	▲
Latvia (LSS)	59	O
Russian Federation	59	O
Lithuania	54	O
Bulgaria	54	O
New Zealand	54	O
International Average	**54**	
England	53	O
Moldova	49	O
Italy	48	O
Israel	47	▼
Romania	46	O
Thailand	45	▼
Cyprus	44	▼
Jordan	36	▼
Turkey	36	▼
Iran, Islamic Rep.	33	▼
Macedonia, Rep. of	33	▼
Indonesia	33	▼
Tunisia	31	▼
Chile	23	▼
Philippines	22	▼
Morocco	22	▼
South Africa	20	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Fractions and Number Sense	Using Complex Procedures

Two possibilities for actual height

The height of a boy was reported as 140 cm. The height had been rounded to the nearest 10 cm. What are two possibilities for the boy's actual height?

Answer: _____ cm and _____ cm

Item Number: V01

SCORING

Correct Response

• One answer 140 and the other answer is in an acceptable range, $135 \leq x < 140$ or $140 < x < 145$.

• Neither answer is 140 cm but both are in the acceptable range $135 \leq x < 140$ and/or $140 < x < 145$.

Incorrect Response

• Both answers within the intervals $145 \leq x \leq 150$ and/or $130 \leq x < 135$

• 130 AND 150

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Finland	85	▲
Czech Republic	82	▲
Slovak Republic	79	▲
Singapore	78	▲
Canada	72	▲
Australia	69	▲
Russian Federation	69	▲
Japan	69	▲
Korea, Rep. of	66	▲
Hungary	66	▲
Hong Kong, SAR	66	▲
Chinese Taipei	65	▲
Netherlands	64	▲
Belgium (Flemish)	61	▲
England	61	▲
Thailand	61	▲
New Zealand	58	▲
Lithuania	57	▲
United States	56	▲
International Average	**44**	
Israel	44	O
Moldova	43	O
Slovenia	41	O
Bulgaria	40	O
Latvia (LSS)	39	O
Malaysia	33	▼
Jordan	29	▼
Italy	25	▼
Indonesia	24	▼
Cyprus	21	▼
Romania	15	▼
Macedonia, Rep. of	13	▼
Philippines	9	▼
Chile	8	▼
Tunisia	7	▼
South Africa	6	▼
Iran, Islamic Rep.	5	▼
Turkey	4	▼
Morocco	3	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Fractions and Number Sense	Investigating and Solving Problems

Ratio of nitrate to total fertilizer

In making a garden fertilizer, a gardener mixes 2 kg of a nitrate, 3 kg of a phosphate, and 6 kg of potash. What is the ratio of nitrate to the total amount of fertilizer?

A. $\dfrac{11}{9}$

B. $\dfrac{2}{3}$

C. $\dfrac{2}{9}$

D. $\dfrac{2}{11}$

Item Number: V03

Overall Percent Correct

Singapore	87	▲
Korea, Rep. of	84	▲
Chinese Taipei	74	▲
Netherlands	74	▲
Hong Kong, SAR	74	▲
Finland	65	▲
Malaysia	62	▲
Japan	61	▲
Canada	55	▲
United States	55	▲
Belgium (Flemish)	54	▲
Slovenia	53	▲
Hungary	50	O
Australia	48	O
Italy	47	O
Russian Federation	46	O
International Average	**45**	
New Zealand	44	O
Thailand	44	O
Indonesia	43	O
England	42	O
Romania	40	O
Bulgaria	40	O
Cyprus	40	O
Israel	40	O
Slovak Republic	37	O
Jordan	36	▼
Latvia (LSS)	35	▼
Turkey	35	▼
Iran, Islamic Rep.	35	▼
Moldova	34	▼
Czech Republic	30	▼
Tunisia	29	▼
Macedonia, Rep. of	26	▼
Lithuania	23	▼
Chile	22	▼
Philippines	21	▼
Morocco	15	▼
South Africa	15	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**D**

Content Domain	Cognitive Domain
Algebra	Knowing

Equation representing relationship

Overall Percent Correct

n is a number. When n is multiplied by 7, and 6 is then added, the result is 41. Which of these equations represents this relation?

A. $7n + 6 = 41$

B. $7n \pm 6 = 41$

C. $7n \times 6 = 41$

D. $7(n + 6) = 41$

Item Number: B12

Hong Kong, SAR	93	▲
Singapore	89	▲
Japan	86	▲
Korea, Rep. of	85	▲
Chinese Taipei	84	▲
Slovenia	83	▲
Canada	82	▲
Russian Federation	82	▲
Slovak Republic	81	▲
Belgium (Flemish)	81	▲
Netherlands	80	▲
Hungary	80	▲
United States	77	▲
Bulgaria	76	▲
Australia	72	▲
Czech Republic	72	▲
Latvia (LSS)	71	▲
Lithuania	71	O
Finland	68	O
Israel	68	O
Thailand	67	O
Romania	67	O
Cyprus	66	O
International Average	**65**	
Moldova	65	O
Macedonia, Rep. of	63	O
England	62	O
Italy	58	▼
New Zealand	58	▼
Tunisia	58	▼
Malaysia	57	▼
Jordan	46	▼
Iran, Islamic Rep.	46	▼
Turkey	41	▼
Chile	38	▼
Indonesia	37	▼
Morocco	35	▼
South Africa	21	▼
Philippines	19	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**A**

Content Domain	Cognitive Domain
Algebra	Using Routine Procedures

Value of *x* from equivalent ratios

If the ratio 7 to 13 is the same as the ratio x to 52, what is the value of x?

A. 7

B. 13

C. 28

D. 364

Item Number: D08

Overall Percent Correct

Singapore	96	▲
Korea, Rep. of	93	▲
Chinese Taipei	90	▲
Hong Kong, SAR	88	▲
Malaysia	84	▲
Canada	84	▲
Japan	82	▲
Australia	80	▲
United States	78	▲
Slovenia	77	▲
Russian Federation	76	▲
Hungary	75	▲
Belgium (Flemish)	75	▲
Italy	74	O
New Zealand	73	O
England	73	O
Thailand	72	O
Netherlands	70	O
Cyprus	70	O
Czech Republic	70	O
International Average	**69**	
Slovak Republic	68	O
Bulgaria	68	O
Latvia (LSS)	66	O
Macedonia, Rep. of	66	O
Romania	64	O
Finland	63	▼
Jordan	61	▼
Israel	61	▼
Moldova	60	▼
Tunisia	60	▼
Indonesia	59	▼
Turkey	59	▼
Iran, Islamic Rep.	58	▼
Lithuania	58	▼
Chile	49	▼
Philippines	47	▼
South Africa	38	▼
Morocco	35	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Algebra	Knowing

Equation to determine cost of cards

The cost, C, of printing greeting cards consists of a fixed charge of 100 cents and a charge of 6 cents for each card printed. Which of these equations can be used to determine the cost of printing n cards?

A. $C = (100 + 6n)$ cents

B. $C = (106 + n)$ cents

C. $C = (6 + 100n)$ cents

D. $C = (106n)$ cents

E. $C = (600n)$ cents

Item Number: D10

Overall Percent Correct

Chinese Taipei	78	▲
Japan	75	▲
Hong Kong, SAR	74	▲
Korea, Rep. of	74	▲
Netherlands	74	▲
Thailand	69	▲
Singapore	64	▲
Bulgaria	62	▲
Belgium (Flemish)	60	▲
Canada	56	▲
Slovenia	55	O
Australia	55	O
United States	55	▲
Russian Federation	54	O
England	53	O
Indonesia	53	O
New Zealand	52	O
Macedonia, Rep. of	51	O
Philippines	51	O
Czech Republic	51	O
International Average	**50**	
Hungary	48	O
Finland	48	O
Slovak Republic	47	O
Cyprus	46	O
Jordan	46	O
Romania	45	O
Italy	42	▼
Israel	42	▼
Malaysia	42	▼
Lithuania	42	▼
Turkey	41	▼
Chile	37	▼
Moldova	33	▼
Iran, Islamic Rep.	30	▼
Latvia (LSS)	29	▼
South Africa	27	▼
Morocco	24	▼
Tunisia	21	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**A**

Content Domain	Cognitive Domain
Algebra	Investigating and Solving Problems

Find 1/3 of number from relationship

Overall Percent Correct

If 4 times a number is 48, what is $\frac{1}{3}$ of the number?

A. 4

B. 8

C. 12

D. 16

Hong Kong, SAR	89	▲
Korea, Rep. of	85	▲
Chinese Taipei	83	▲
Singapore	82	▲
Japan	73	▲
Belgium (Flemish)	72	▲
Finland	68	▲
Bulgaria	66	▲
Hungary	63	▲
Russian Federation	63	▲
Australia	54	▲
Slovenia	54	▲
Malaysia	54	▲
Canada	53	▲
United States	50	O
Cyprus	49	O
International Average	**47**	
Latvia (LSS)	46	O
Israel	44	O
Turkey	44	O
New Zealand	43	O
Romania	41	O
Netherlands	41	O
Moldova	41	O
Czech Republic	40	O
England	40	▼
Slovak Republic	38	▼
Jordan	36	▼
Iran, Islamic Rep.	36	▼
Macedonia, Rep. of	34	▼
Thailand	31	▼
Italy	29	▼
South Africa	27	▼
Chile	23	▼
Indonesia	20	▼
Lithuania	19	▼
Philippines	19	▼
Morocco	15	▼
Tunisia	10	▼

Item Number: F11

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**A**

Content Domain	Cognitive Domain
Algebra	Knowing

Equation from *x/y* table

The table shows a relation between x and y.

x	2	3	4	5
y	7	10	13	16

Which of these equations expresses this relation?

A.　$y = x + 5$

B.　$y = x \pm 5$

C.　$y = \dfrac{1}{3}(x \pm 1)$

D.　$y = 3x + 1$

Item Number: H10

Overall Percent Correct

Country		
Korea, Rep. of	84	▲
Hungary	80	▲
Japan	76	▲
Chinese Taipei	72	▲
Singapore	71	▲
Netherlands	71	▲
Australia	68	▲
Hong Kong, SAR	68	▲
Russian Federation	65	▲
Slovenia	60	▲
Belgium (Flemish)	60	▲
United States	57	▲
England	57	▲
Slovak Republic	57	O
Canada	55	▲
Czech Republic	53	O
New Zealand	52	O
Macedonia, Rep. of	51	O
Malaysia	51	O
Jordan	50	O
Latvia (LSS)	50	O
International Average	**49**	
Bulgaria	47	O
Tunisia	41	▼
Israel	41	▼
Italy	40	▼
Finland	39	▼
Indonesia	37	▼
Lithuania	36	▼
Romania	36	▼
Cyprus	36	▼
Thailand	33	▼
Turkey	32	▼
Iran, Islamic Rep.	31	▼
Moldova	31	▼
Philippines	22	▼
Chile	21	▼
Morocco	20	▼
South Africa	19	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**D**

Content Domain	Cognitive Domain
Algebra	Knowing

Symbolic linear equation of magazines

□ represents the number of magazines that Lina reads each week. Which of these represents the total number of magazines that Lina reads in 6 weeks?

A. $6 + \square$

B. $6 \times \square$

C. $\square + 6$

D. $(\square + \square) \times 6$

Item Number: H12

Overall Percent Correct

Country		
Singapore	95	▲
Belgium (Flemish)	88	▲
Chinese Taipei	87	▲
Netherlands	87	▲
Canada	86	▲
United States	86	▲
Malaysia	86	▲
Japan	85	▲
Australia	83	▲
Finland	82	▲
Hungary	81	▲
Slovenia	81	▲
Korea, Rep. of	81	▲
Czech Republic	80	▲
England	79	▲
Slovak Republic	79	▲
New Zealand	77	▲
Latvia (LSS)	77	▲
Russian Federation	77	O
Israel	77	▲
Cyprus	75	O
Tunisia	75	O
Bulgaria	73	O
Italy	72	O
International Average	**72**	
Romania	71	O
Lithuania	66	O
Hong Kong, SAR	64	▼
Jordan	64	▼
Thailand	63	▼
Moldova	63	▼
Indonesia	54	▼
Chile	54	▼
Iran, Islamic Rep.	51	▼
Turkey	51	▼
Macedonia, Rep. of	47	▼
Philippines	45	▼
Morocco	44	▼
South Africa	36	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**B**

Content Domain	Cognitive Domain
Algebra	Using Routine Procedures

Missing number in table

The table represents a relation between x and y.

What is the missing number in the table?

x	y
2	5
3	7
4	?
7	15

A. 9

B. 10

C. 11

D. 12

E. 13

Item Number: J17

Overall Percent Correct

Netherlands	81	▲
Chinese Taipei	79	▲
Japan	78	▲
Korea, Rep. of	78	▲
Hong Kong, SAR	77	▲
Hungary	74	▲
Slovenia	73	▲
New Zealand	72	▲
Canada	71	O
Australia	70	O
Moldova	69	O
Israel	69	O
Slovak Republic	68	O
Thailand	68	O
Belgium (Flemish)	67	O
Finland	67	O
Singapore	67	O
Russian Federation	66	O
Italy	65	O
Tunisia	65	O
Lithuania	65	O
International Average	**65**	
Latvia (LSS)	65	O
Bulgaria	64	O
Cyprus	64	O
Romania	63	O
United States	63	O
Czech Republic	63	O
Macedonia, Rep. of	63	O
England	62	O
Jordan	61	O
Malaysia	58	O
Turkey	58	▼
Indonesia	57	▼
Iran, Islamic Rep.	53	▼
Philippines	48	▼
Chile	47	▼
South Africa	43	▼
Morocco	40	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**A**

Content Domain	Cognitive Domain
Algebra	Investigating and Solving Problems

Distance traveled by elevator

In a sequence of starts and stops, an elevator travels from the first floor to the fifth floor and then to the second floor. From there, the elevator travels to the fourth floor and then to the third floor. If the floors are 3 m apart, how far has the elevator traveled?

A. 18 m

B. 27 m

C. 30 m

D. 45 m

Item Number: L12

Overall Percent Correct

Korea, Rep. of	77	▲
Japan	74	▲
Chinese Taipei	72	▲
Hong Kong, SAR	72	▲
Finland	72	▲
Belgium (Flemish)	70	▲
Australia	69	▲
Singapore	69	▲
Czech Republic	66	▲
Malaysia	63	▲
Slovak Republic	62	O
Hungary	61	▲
Canada	60	▲
Lithuania	60	O
New Zealand	59	O
Russian Federation	59	O
Slovenia	58	O
Netherlands	58	O
England	57	O
Latvia (LSS)	55	O
United States	55	O
International Average	**53**	
Cyprus	52	O
Italy	51	O
Moldova	49	O
Macedonia, Rep. of	45	O
Tunisia	44	▼
Turkey	43	▼
Romania	42	▼
Jordan	39	▼
Chile	39	▼
Israel	39	▼
Iran, Islamic Rep.	38	▼
Thailand	38	▼
Indonesia	37	▼
South Africa	33	▼
Morocco	32	▼
Philippines	26	▼
Bulgaria	21	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Algebra	Communicating and Reasoning

Correct equation based on *x/y* table

Overall Percent Correct

The table represents a relation between x and y.

Which of the following equations could represent the same relation?

A. $y = 2x + 2$

B. $y = 2x - 1$

C. $y = 3x + 2$

D. $y = 3x + 1$

E. $y = 3x - 2$

x	y
1	1
2	4
3	7
4	10

Item Number: L14

Korea, Rep. of	80	▲
Hungary	75	▲
Chinese Taipei	75	▲
Singapore	74	▲
Hong Kong, SAR	74	▲
Japan	69	▲
Belgium (Flemish)	67	▲
Australia	64	▲
Netherlands	64	▲
Russian Federation	61	▲
Slovak Republic	56	▲
Slovenia	54	O
Canada	53	O
England	51	O
Czech Republic	50	O
United States	49	O
New Zealand	49	O
Macedonia, Rep. of	48	O
Jordan	48	O
Latvia (LSS)	45	O
International Average	**45**	
Bulgaria	44	O
Israel	41	O
Malaysia	41	O
Italy	39	O
Lithuania	36	O
Romania	35	O
Tunisia	33	▼
Moldova	33	▼
Finland	32	▼
Indonesia	27	▼
Thailand	24	▼
Cyprus	24	▼
Iran, Islamic Rep.	22	▼
Turkey	21	▼
South Africa	14	▼
Morocco	14	▼
Philippines	13	▼
Chile	12	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	E

Content Domain	Cognitive Domain
Algebra	Using Routine Procedures

Values in proportionality table

The table shows some values of x and y, where x is proportional to y.

x	4	8	Q
y	9	P	45

What are the values of P and Q?

A. $P = 40$ and $Q = 13$

B. $P = 18$ and $Q = 17$

C. $P = 20$ and $Q = 18$

D. $P = 40$ and $Q = 18$

E. $P = 18$ and $Q = 20$

Item Number: L15

Overall Percent Correct

Chinese Taipei	69	▲
Japan	62	▲
Singapore	57	▲
Korea, Rep. of	54	▲
Hong Kong, SAR	51	▲
Belgium (Flemish)	49	▲
Netherlands	49	▲
Russian Federation	43	▲
Malaysia	43	▲
Slovak Republic	38	O
Canada	38	O
Hungary	38	O
Jordan	37	O
Slovenia	34	O
United States	34	O
Romania	34	O
International Average	**33**	
Australia	33	O
Bulgaria	32	O
Thailand	30	O
Indonesia	29	O
Italy	28	O
Czech Republic	28	O
England	28	O
Lithuania	26	O
Moldova	26	O
Cyprus	26	O
New Zealand	24	▼
Turkey	24	▼
Iran, Islamic Rep.	24	▼
Latvia (LSS)	23	▼
Macedonia, Rep. of	23	▼
South Africa	21	▼
Finland	21	▼
Philippines	21	▼
Israel	20	▼
Morocco	17	▼
Chile	15	▼
Tunisia	15	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**E**

Content Domain	Cognitive Domain
Algebra	Using Routine Procedures

Value of *x* in mathematical equation

Find the value of x if $12x - 10 = 6x + 32$

Answer: _____

Item Number: L17

SCORING

Correct Response

• 7

Incorrect Response

• $3\frac{2}{3}$ OR $2\frac{1}{3}$ OR $1\frac{2}{9}$ [uses incorrect operation: $32 - 10 = 22$, $12x + 6x = 18x$, or both]

• Any expression or equation, other than $x = 7$, containing x

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Japan	85	▲
Hong Kong, SAR	80	▲
Korea, Rep. of	80	▲
Slovak Republic	78	▲
Russian Federation	77	▲
Slovenia	76	▲
Singapore	75	▲
Hungary	74	▲
Chinese Taipei	73	▲
Romania	70	▲
Czech Republic	66	▲
Lithuania	62	▲
Latvia (LSS)	58	▲
Belgium (Flemish)	58	▲
Moldova	56	▲
Macedonia, Rep. of	54	O
Cyprus	51	O
Israel	51	O
Italy	46	O
International Average	**44**	
Malaysia	43	O
Bulgaria	34	▼
United States	34	▼
Canada	33	▼
Turkey	32	▼
Australia	31	▼
Thailand	29	▼
England	26	▼
Finland	24	▼
Iran, Islamic Rep.	23	▼
Netherlands	19	▼
New Zealand	19	▼
Jordan	18	▼
Indonesia	18	▼
Chile	12	▼
Morocco	7	▼
Philippines	6	▼
Tunisia	6	▼
South Africa	5	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Algebra	Using Routine Procedures

Value of expression substituting x=3

If $x = 3$, what is the value of $\dfrac{5x + 3}{4x - 3}$?

Answer: _____

Item Number: N13

SCORING

Correct Response

- 2
- 18/9, 2/1 or other fraction equivalent to 2
- Other correct

Incorrect Response

- Indicates the correct substitution of x = 3 in numerator and/or denominator but student did not correctly complete the solution.
- Indicates a wrong substitution such as 5x = 53 or 5x = 5 + 3 in the numerator; for example, any fractions with 56 or 11 as numerators, or 40 or 4 as denominators.
- A response containing the variable x
- Cancels or ignores x's *(e.g., 8/1, 8, 7, etc.)*
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Country		
Singapore	83	▲
Chinese Taipei	81	▲
Hong Kong, SAR	81	▲
Hungary	80	▲
Russian Federation	79	▲
Slovenia	75	▲
Korea, Rep. of	75	▲
Slovak Republic	72	▲
Japan	69	▲
Lithuania	67	▲
Belgium (Flemish)	67	▲
Canada	67	▲
Bulgaria	65	▲
Latvia (LSS)	64	▲
Czech Republic	62	O
United States	61	▲
Australia	61	O
Romania	59	O
Moldova	57	O
International Average	**53**	
Macedonia, Rep. of	53	O
Israel	53	O
Netherlands	50	O
Malaysia	48	O
Cyprus	47	O
Thailand	47	O
Tunisia	47	▼
Italy	47	O
England	46	O
Finland	44	▼
New Zealand	42	▼
Jordan	40	▼
Turkey	35	▼
Indonesia	28	▼
Iran, Islamic Rep.	28	▼
Philippines	15	▼
Chile	14	▼
Morocco	12	▼
South Africa	9	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Algebra	Knowing

Expression equivalent to *n* x *n* x *n*

Which of these expressions is equivalent to *n* x *n* x *n* for all values of *n*?

A. $\dfrac{n}{3}$

B. $n + 3$

C. $3n$

D. n^3

Item Number: P09

Overall Percent Correct

Singapore	90	▲
Korea, Rep. of	86	▲
Hong Kong, SAR	85	▲
United States	85	▲
Japan	85	▲
Tunisia	84	▲
Chinese Taipei	83	▲
Czech Republic	81	▲
Belgium (Flemish)	80	O
Slovak Republic	80	▲
Indonesia	80	▲
Slovenia	80	▲
Thailand	80	▲
Hungary	79	▲
Latvia (LSS)	77	O
Australia	77	O
Russian Federation	76	O
Canada	75	O
Cyprus	74	O
Malaysia	74	O
Italy	72	O
Lithuania	71	O
International Average	**71**	
Iran, Islamic Rep.	71	O
Bulgaria	69	O
Israel	67	O
Chile	67	O
Romania	66	O
New Zealand	66	O
England	61	▼
Jordan	61	▼
Netherlands	55	▼
South Africa	55	▼
Moldova	53	▼
Finland	53	▼
Philippines	49	▼
Turkey	47	▼
Morocco	34	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**D**

Content Domain	Cognitive Domain
Algebra	Knowing

Equivalent expression: *k+k+k+k+k*

For all numbers k,
$k + k + k + k + k$ can be written as

A. $k + 5$

B. $5k$

C. k^5

D. $5(k + 1)$

Item Number: P11

Overall Percent Correct

Slovak Republic	80	▲
Hong Kong, SAR	80	▲
Singapore	76	▲
Chinese Taipei	76	▲
Hungary	75	▲
Slovenia	72	▲
Czech Republic	70	▲
Korea, Rep. of	69	▲
Belgium (Flemish)	69	▲
Russian Federation	68	▲
Malaysia	67	▲
Latvia (LSS)	67	▲
Cyprus	65	O
Bulgaria	65	O
Romania	65	O
Macedonia, Rep. of	62	O
Japan	61	O
Turkey	59	O
Israel	58	O
International Average	**57**	
Netherlands	57	O
Italy	57	O
Finland	57	O
Canada	56	O
Moldova	55	O
Australia	54	O
New Zealand	54	O
Tunisia	53	O
Lithuania	52	O
Jordan	48	▼
England	48	▼
United States	46	▼
Indonesia	41	▼
South Africa	38	▼
Philippines	37	▼
Iran, Islamic Rep.	36	▼
Chile	35	▼
Thailand	33	▼
Morocco	19	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**B**

Content Domain	Cognitive Domain
Algebra	Knowing

Expression when *a, b, c* are real

Which of the following is true when a, b, and c are different real numbers?

A. $a - b = b - a$

B. $a(b - c) = b(c - a)$

C. $b - c = c - b$

D. $ab = ba$

E. $ab - c = ab - b$

Item Number: R10

Overall Percent Correct

Russian Federation	72	▲
Korea, Rep. of	69	▲
Hong Kong, SAR	67	▲
Chinese Taipei	64	▲
Hungary	58	▲
Belgium (Flemish)	56	▲
Singapore	53	▲
Czech Republic	50	O
Japan	49	▲
Slovak Republic	48	▲
Bulgaria	47	▲
Canada	43	O
Latvia (LSS)	42	O
Romania	42	O
Australia	41	O
Slovenia	41	O
United States	40	O
Netherlands	40	O
International Average	**37**	
Tunisia	37	O
Moldova	36	O
Israel	35	O
Jordan	31	O
Macedonia, Rep. of	30	O
New Zealand	30	O
England	30	O
Lithuania	30	O
Thailand	29	▼
Cyprus	28	▼
Malaysia	26	▼
Italy	23	▼
Morocco	21	▼
Turkey	20	▼
Finland	19	▼
South Africa	19	▼
Iran, Islamic Rep.	18	▼
Indonesia	14	▼
Chile	11	▼
Philippines	8	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response: D

Content Domain	Cognitive Domain
Algebra	Knowing

Operations on negative number

| | **Overall Percent Correct** |

If k represents a negative number, which of these is a positive number?

A. k^2

B. k^3

C. $2k$

D. $\dfrac{k}{2}$

Item Number: R12

Overall Percent Correct		
Chinese Taipei	84	▲
Russian Federation	81	▲
Hong Kong, SAR	79	▲
Korea, Rep. of	69	▲
Japan	69	▲
Slovenia	67	▲
Latvia (LSS)	67	▲
Hungary	67	▲
Slovak Republic	66	▲
Bulgaria	66	▲
Lithuania	64	▲
Belgium (Flemish)	63	▲
Singapore	63	▲
Romania	59	▲
Czech Republic	55	O
Moldova	49	O
Italy	49	O
Israel	48	O
International Average	**47**	
United States	46	O
Netherlands	42	O
Malaysia	42	O
Tunisia	41	O
Macedonia, Rep. of	40	O
Canada	39	O
Australia	34	▼
Turkey	33	▼
Thailand	32	▼
Indonesia	30	▼
Iran, Islamic Rep.	30	▼
Cyprus	29	▼
Morocco	29	▼
Jordan	28	▼
Chile	27	▼
England	27	▼
Finland	25	▼
Philippines	25	▼
New Zealand	20	▼
South Africa	16	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

| **Correct Response:** | **A** |

Content Domain	Cognitive Domain
Algebra	Investigating and Solving Problems

Total club members: boys and girls

A club has 86 members, and there are 14 more girls than boys. How many boys and how many girls are members of the club?

Show your work.

Item Number: T01

SCORING

Correct Response

• 36 boys and 50 girls [Numerical method: *e.g., 86 ÷ 2 = 43; 43 − 7 = 36 boys; 43 + 7 = 50 girls*]

• 36 boys and 50 girls [Algebraic method: *e.g., b + (b + 14) = 86; 2b = 72; b = 36; g = 36 + 14 = 50*]

• Other fully satisfactory method including "guess and check" with justification that 36 + 50 = 86

Partial Response

• Either 36 boys or 50 girls, with or without another (incorrect) number

• 36 and 50 are given [Makes correct computations but reverses labels or does not include any mention of which is boys or girls]

• 36 boys and 50 girls, no method shown

• Gives an algebraic equation or system of equations that can lead to the correct solution

• Other partially correct

Incorrect Response

• 29 boys and 57 girls [Computes 86 ÷ 2 = 43; 43 − 14 = 29 and 43 + 14 = 57]

• One of the numbers is 72 [Computes 86 − 14]

• 29 boys and 43 girls [Computes 43 − 14 = 29]

• Gives an algebraic equation or system of equations that cannot lead to a correct solution

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Singapore	72	▲
Chinese Taipei	66	▲
Hong Kong, SAR	62	▲
Belgium (Flemish)	62	▲
Korea, Rep. of	61	▲
Slovak Republic	53	▲
Japan	53	▲
Hungary	46	▲
Czech Republic	46	▲
Canada	42	▲
Bulgaria	41	O
Russian Federation	40	O
Netherlands	38	O
Romania	38	O
Australia	37	O
Slovenia	37	O
England	34	O
Cyprus	34	O
International Average	**33**	
Finland	32	O
Latvia (LSS)	32	O
New Zealand	32	O
Malaysia	32	O
Israel	30	O
United States	29	▼
Moldova	26	▼
Italy	24	▼
Lithuania	23	▼
Turkey	20	▼
Thailand	20	▼
Macedonia, Rep. of	16	▼
Iran, Islamic Rep.	14	▼
Indonesia	14	▼
Jordan	13	▼
Tunisia	10	▼
Philippines	9	▼
Chile	8	▼
Morocco	5	▼
South Africa	4	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Algebra	Investigating and Solving Problems

Sequence of figures with circles

The figures show four sets consisting of circles.

Figure 1   Figure 2   Figure 3   Figure 4

a) Complete the table below. First, fill in how many circles make up Figure 4. Then, find the number of circles that would be needed for the 5th figure if the sequence of figures is extended.

Figure	Number of circles
1	1
2	3
3	6
4	
5	

b) The sequence of figures is extended to the 7th figure. How many circles would be needed for Figure 7?

Answer: _____

c) The 50th figure in the sequence contains 1275 circles. Determine the number of circles in the 51st figure. Without drawing the 51st figure, explain or show how you arrived at your answer.

Item Number: V04A

SCORING

A. Scoring for Number of Circles in Figures 4 and 5

Correct Response

• 10 AND 15

Incorrect Response

• 10 and any number other than 15

• 10 and no numerical response for 5th figure

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Korea, Rep. of	91	▲
Japan	91	▲
Singapore	89	▲
Chinese Taipei	87	▲
Hong Kong, SAR	87	▲
Netherlands	83	▲
England	81	▲
Belgium (Flemish)	81	▲
Canada	81	▲
Australia	81	▲
New Zealand	81	▲
Finland	80	▲
Czech Republic	79	▲
Hungary	77	▲
Slovenia	77	▲
Slovak Republic	77	▲
Malaysia	73	▲
United States	73	▲
Bulgaria	68	O
Russian Federation	67	O
Italy	66	O
International Average	**65**	
Lithuania	64	O
Cyprus	64	O
Moldova	64	O
Latvia (LSS)	63	O
Israel	63	O
Romania	57	O
Thailand	54	▼
Macedonia, Rep. of	51	▼
Indonesia	47	▼
Turkey	43	▼
Jordan	41	▼
Tunisia	39	▼
Iran, Islamic Rep.	36	▼
Chile	35	▼
Philippines	27	▼
Morocco	20	▼
South Africa	14	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Algebra	Investigating and Solving Problems

Sequence of figures with circles

The figures show four sets consisting of circles.

Figure 1   Figure 2   Figure 3   Figure 4

a) Complete the table below. First, fill in how many circles make up Figure 4. Then, find the number of circles that would be needed for the 5th figure if the sequence of figures is extended.

Figure	Number of circles
1	1
2	3
3	6
4	
5	

b) The sequence of figures is extended to the 7th figure. How many circles would be needed for Figure 7?

Answer: _____

c) The 50th figure in the sequence contains 1275 circles. Determine the number of circles in the 51st figure. Without drawing the 51st figure, explain or show how you arrived at your answer.

Item Number: V04B

SCORING

B. Scoring for Number of Circles in Figure 7

Correct Response

 • 28

Incorrect Response

 • 21

 • 22

 • Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Country		
Korea, Rep. of	86	▲
Japan	83	▲
Hong Kong, SAR	83	▲
Singapore	82	▲
Chinese Taipei	81	▲
Canada	72	▲
Australia	71	▲
Belgium (Flemish)	70	▲
England	68	▲
Netherlands	67	▲
Slovak Republic	67	▲
Hungary	66	▲
Slovenia	66	▲
Czech Republic	64	▲
New Zealand	64	▲
Malaysia	64	▲
Finland	62	▲
United States	62	▲
Russian Federation	54	O
International Average	**54**	
Bulgaria	54	O
Cyprus	53	O
Moldova	52	O
Italy	52	O
Israel	52	O
Latvia (LSS)	50	O
Lithuania	47	O
Romania	47	▼
Thailand	46	▼
Macedonia, Rep. of	41	▼
Indonesia	38	▼
Turkey	33	▼
Jordan	30	▼
Tunisia	29	▼
Iran, Islamic Rep.	24	▼
Chile	24	▼
Philippines	21	▼
Morocco	12	▼
South Africa	9	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Algebra	Communicating and Reasoning

Sequence of figures with circles

The figures show four sets consisting of circles.

Figure 1   Figure 2   Figure 3   Figure 4

a) Complete the table below. First, fill in how many circles make up Figure 4. Then, find the number of circles that would be needed for the 5th figure if the sequence of figures is extended.

Figure	Number of circles
1	1
2	3
3	6
4	
5	

b) The sequence of figures is extended to the 7th figure. How many circles would be needed for Figure 7?

Answer: _____

c) The 50th figure in the sequence contains 1275 circles. Determine the number of circles in the 51st figure. Without drawing the 51st figure, explain or show how you arrived at your answer.

Item Number: V04C

SCORING

C. Scoring for Explanation and Answer for 51st Figure

Correct Response
- 1326. Correct general expression $\frac{n\,(n+1)}{2}$, $\frac{51(52)}{2}$, or equivalent
- 1326 [Adds 1275 + 51]
- Other fully correct, including [(figure number)^2 – number of circles in previous figure]

Partial Response
- 1326 without showing how obtained
- Correct method but does not write 1326 as answer
- Other partially correct

Incorrect Response
- Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Country		
Korea, Rep. of	70	▲
Chinese Taipei	68	▲
Japan	66	▲
Singapore	65	▲
Hong Kong, SAR	57	▲
Netherlands	48	▲
Belgium (Flemish)	44	▲
Canada	43	▲
Australia	39	▲
Hungary	38	▲
Malaysia	37	▲
Slovenia	37	O
England	35	O
United States	34	▲
Czech Republic	34	O
Slovak Republic	31	O
New Zealand	31	O
International Average	**30**	
Finland	30	O
Israel	27	O
Russian Federation	27	O
Moldova	26	O
Bulgaria	26	O
Thailand	25	O
Italy	24	▼
Indonesia	24	▼
Latvia (LSS)	22	▼
Romania	19	▼
Lithuania	19	▼
Cyprus	15	▼
Macedonia, Rep. of	13	▼
Jordan	13	▼
Turkey	11	▼
Philippines	9	▼
Chile	8	▼
Tunisia	8	▼
Iran, Islamic Rep.	8	▼
South Africa	3	▼
Morocco	3	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Measurement	Knowing

Units to measure mass of egg

What units would be best to use to measure the weight (mass) of an egg?

A. centimeters

B. milliliters

C. grams

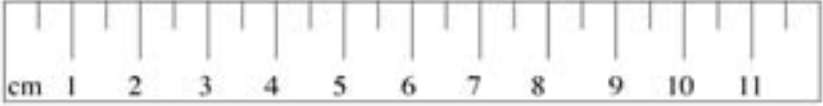D. kilograms

Item Number: D11

Overall Percent Correct

Japan	98	▲
Slovak Republic	96	▲
Hungary	96	▲
Czech Republic	95	▲
Korea, Rep. of	93	▲
Bulgaria	93	▲
Slovenia	93	▲
Singapore	93	▲
Belgium (Flemish)	92	▲
Russian Federation	92	▲
Australia	91	▲
Italy	90	▲
Netherlands	89	▲
Latvia (LSS)	89	▲
Malaysia	88	▲
Lithuania	88	▲
Finland	87	▲
Macedonia, Rep. of	87	▲
New Zealand	87	▲
Tunisia	86	▲
England	86	▲
Canada	85	▲
Romania	85	O
Moldova	82	O
Hong Kong, SAR	82	O
International Average	**81**	
Cyprus	79	O
Turkey	78	O
Israel	75	▼
Chinese Taipei	73	▼
Jordan	73	▼
Thailand	69	▼
Chile	69	▼
Iran, Islamic Rep.	68	▼
United States	68	▼
Morocco	55	▼
South Africa	48	▼
Philippines	47	▼
Indonesia	34	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Measurement	Knowing

Measurement accuracy of ruler

Using a centimeter ruler like this one, you can measure accurately to the nearest

A. millimeter

B. half-millimeter

C. centimeter

D. half-centimeter

Item Number: F10

Overall Percent Correct

Finland	81	▲
Belgium (Flemish)	80	▲
Slovenia	75	▲
Latvia (LSS)	75	▲
Russian Federation	74	▲
Czech Republic	74	▲
Netherlands	72	▲
Hungary	71	▲
Bulgaria	65	▲
Australia	63	▲
Korea, Rep. of	61	▲
Italy	61	▲
Slovak Republic	60	▲
Lithuania	59	▲
Hong Kong, SAR	57	▲
New Zealand	56	▲
Singapore	52	O
Canada	52	O
England	51	O
International Average	**49**	
Israel	48	O
Chinese Taipei	47	O
Romania	45	O
Macedonia, Rep. of	43	▼
United States	42	▼
Moldova	41	▼
Thailand	37	▼
Indonesia	35	▼
Japan	35	▼
Chile	33	▼
Malaysia	29	▼
Tunisia	29	▼
South Africa	27	▼
Cyprus	24	▼
Iran, Islamic Rep.	23	▼
Jordan	23	▼
Morocco	20	▼
Philippines	18	▼
Turkey	18	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	D

Content Domain	Cognitive Domain
Measurement	Investigating and Solving Problems

Area of path around garden

A rectangular garden that is next to a building has a path around the other three sides, as shown.

What is the area of the path?

A.   144 m²

B.   64 m²

C.   44 m²

D.   16 m²

Item Number: J10

Overall Percent Correct

Hong Kong, SAR	79	▲
Singapore	78	▲
Japan	74	▲
Chinese Taipei	73	▲
Korea, Rep. of	67	▲
Netherlands	57	▲
Australia	52	▲
Malaysia	52	▲
Slovak Republic	51	O
Canada	51	O
Belgium (Flemish)	51	▲
Finland	46	O
Hungary	46	O
Slovenia	46	O
Cyprus	45	O
Italy	45	O
Bulgaria	42	O
International Average	**42**	
Czech Republic	40	O
England	40	O
New Zealand	40	O
Tunisia	38	O
Russian Federation	38	O
Thailand	35	O
Moldova	34	O
United States	33	▼
Morocco	31	▼
Lithuania	31	▼
Macedonia, Rep. of	30	▼
Romania	29	▼
Jordan	29	▼
Israel	28	▼
Latvia (LSS)	28	▼
Iran, Islamic Rep.	26	▼
Indonesia	25	▼
Turkey	22	▼
Chile	18	▼
Philippines	15	▼
South Africa	15	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	B

Content Domain	Cognitive Domain
Measurement	Investigating and Solving Problems

Most paces to walk to end of hallway

Four girls measured the length of their paces. The chart shows their measurements.

Name	Length of Pace
Polly	80 cm
Maria	65 cm
Helen	75 cm
Susan	60 cm

Who would take the most paces in walking from one end of a hallway to the other?

A. Polly

B. Maria

C. Helen

D. Susan

Item Number: L13

Overall Percent Correct

Country		
Belgium (Flemish)	94	▲
Hungary	91	▲
Finland	90	▲
Netherlands	90	▲
Japan	86	▲
Lithuania	84	▲
Latvia (LSS)	81	▲
Chinese Taipei	81	▲
Czech Republic	81	▲
Slovak Republic	81	▲
Chile	81	▲
Australia	79	▲
Slovenia	79	▲
Russian Federation	77	▲
Canada	76	▲
Italy	75	▲
Jordan	75	▲
Hong Kong, SAR	75	▲
England	74	O
Korea, Rep. of	72	O
Cyprus	70	O
Romania	68	O
New Zealand	68	O
International Average	**67**	
Tunisia	67	O
Israel	67	O
Moldova	66	O
Bulgaria	65	O
Singapore	62	O
United States	57	▼
Macedonia, Rep. of	56	▼
Thailand	54	▼
Malaysia	50	▼
Iran, Islamic Rep.	48	▼
Turkey	45	▼
Indonesia	27	▼
South Africa	23	▼
Morocco	20	▼
Philippines	20	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**D**

Content Domain	Cognitive Domain
Measurement	Knowing

Angle closest to 45 degrees

Which angle in the figure has a measure closest to 45°?

A.   *p*

B.   *q*

C.   *r*

D.   *s*

Item Number: N15

Overall Percent Correct

Japan	81	▲
Korea, Rep. of	81	▲
Chinese Taipei	79	▲
Slovak Republic	76	▲
Canada	73	▲
Finland	73	▲
Russian Federation	73	▲
Hong Kong, SAR	73	▲
Singapore	72	▲
Hungary	72	▲
Belgium (Flemish)	70	▲
Latvia (LSS)	70	▲
Australia	68	O
Thailand	64	O
Malaysia	63	O
Romania	62	O
Iran, Islamic Rep.	61	O
Czech Republic	61	O
Bulgaria	61	O
England	61	O
Slovenia	61	O
International Average	**60**	
Macedonia, Rep. of	60	O
Moldova	58	O
Lithuania	58	O
Cyprus	56	O
New Zealand	56	O
Tunisia	53	O
Netherlands	52	O
Indonesia	51	▼
Israel	51	▼
United States	51	▼
Italy	51	▼
Chile	48	▼
Turkey	45	▼
Jordan	45	▼
Morocco	39	▼
Philippines	32	▼
South Africa	32	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response: D

Content Domain	Cognitive Domain
Measurement	Investigating and Solving Problems

Ratio of width/perimeter in rectangle

The rectangle below is twice as long as it is wide.

What is the ratio of the width of the rectangle to its perimeter?

A. $\dfrac{1}{2}$

B. $\dfrac{1}{3}$

C. $\dfrac{1}{4}$

D. $\dfrac{1}{6}$

Item Number: P08

Overall Percent Correct

Singapore	56	▲
Chinese Taipei	53	▲
Hong Kong, SAR	45	▲
Japan	44	▲
Italy	32	▲
Korea, Rep. of	30	▲
Belgium (Flemish)	29	▲
Romania	28	O
Russian Federation	26	O
Bulgaria	25	O
International Average	**22**	
Slovak Republic	21	O
Malaysia	21	O
Slovenia	21	O
Moldova	21	O
Jordan	20	O
Czech Republic	20	O
Latvia (LSS)	20	O
Lithuania	19	O
Australia	18	O
Turkey	18	O
South Africa	18	O
Tunisia	17	O
Indonesia	17	O
Cyprus	17	O
Hungary	16	O
New Zealand	16	O
Canada	16	▼
Israel	15	▼
Netherlands	15	O
Iran, Islamic Rep.	15	▼
Chile	14	▼
England	13	▼
Macedonia, Rep. of	13	▼
Morocco	12	▼
United States	11	▼
Finland	11	▼
Thailand	9	▼
Philippines	8	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**D**

Content Domain	Cognitive Domain
Measurement	Using Complex Procedures

Length of string pulled straight

If the string in the diagram is pulled straight, which of these is closest to its length?

A.   5 cm

B.   6 cm

C.   7 cm

D.   8 cm

Item Number: P12

Overall Percent Correct

Hungary	59	▲
Japan	57	▲
Slovak Republic	57	▲
Netherlands	56	▲
Belgium (Flemish)	54	▲
Hong Kong, SAR	53	▲
Czech Republic	53	▲
Chinese Taipei	53	▲
Latvia (LSS)	53	▲
Singapore	52	▲
Australia	52	▲
Slovenia	52	▲
Finland	50	O
Korea, Rep. of	50	▲
Russian Federation	48	O
Malaysia	46	O
Canada	46	O
New Zealand	45	O
Lithuania	44	O
England	43	O
International Average	**41**	
Thailand	41	O
Moldova	40	O
Bulgaria	39	O
United States	39	O
Tunisia	38	O
Cyprus	36	O
Romania	36	O
Israel	34	O
Iran, Islamic Rep.	33	▼
Italy	32	▼
Macedonia, Rep. of	32	▼
Turkey	30	▼
Jordan	26	▼
Chile	25	▼
Indonesia	23	▼
Philippines	15	▼
South Africa	15	▼
Morocco	11	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Measurement	Investigating and Solving Problems

Area of rectangle inside parallelogram

The figure shows a shaded rectangle inside a parallelogram.

What is the area of the shaded rectangle?

Answer: _____

Item Number: T03

SCORING

Note: There is no distinction made between responses with or without units.

Correct Response

• 20

Incorrect Response

• 32 [4 x 8]

• 18 [perimeter]

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Singapore	83	▲
Japan	80	▲
Hong Kong, SAR	78	▲
Korea, Rep. of	78	▲
Chinese Taipei	75	▲
Belgium (Flemish)	65	▲
Canada	58	▲
Slovak Republic	57	▲
Finland	57	▲
Malaysia	56	▲
Netherlands	55	O
Australia	55	▲
Bulgaria	52	O
Slovenia	49	O
Russian Federation	49	O
Italy	48	O
England	48	O
Czech Republic	46	O
Hungary	45	O
Latvia (LSS)	44	O
International Average	**43**	
Romania	43	O
New Zealand	41	O
Cyprus	41	O
Moldova	38	O
Tunisia	38	▼
Lithuania	35	▼
United States	34	▼
Thailand	33	▼
Israel	28	▼
Jordan	26	▼
Iran, Islamic Rep.	25	▼
Macedonia, Rep. of	25	▼
Turkey	20	▼
Indonesia	20	▼
Morocco	8	▼
Chile	7	▼
Philippines	6	▼
South Africa	3	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Geometry	Using Complex Procedures

Cube from folded 2-dimensional net

Which of these cubes could be made by folding the figure above?

A.　B.　C.　D.

Item Number: B11

Overall Percent Correct

Japan	89	▲
Korea, Rep. of	85	▲
Hong Kong, SAR	84	▲
Singapore	83	▲
Chinese Taipei	83	▲
Netherlands	82	▲
Belgium (Flemish)	82	▲
Czech Republic	78	▲
Finland	77	▲
Australia	75	▲
Slovak Republic	74	▲
Canada	74	▲
Malaysia	71	▲
Latvia (LSS)	71	▲
New Zealand	70	▲
Slovenia	68	▲
Hungary	68	▲
United States	65	▲
England	64	O
Bulgaria	64	O
Lithuania	60	O
Russian Federation	60	O
International Average	**59**	
Italy	55	O
Thailand	53	O
Chile	48	▼
Israel	48	▼
Moldova	47	▼
Cyprus	45	▼
Romania	42	▼
Macedonia, Rep. of	39	▼
Indonesia	38	▼
Tunisia	37	▼
Turkey	34	▼
Jordan	34	▼
Iran, Islamic Rep.	28	▼
Philippines	24	▼
Morocco	21	▼
South Africa	15	▼

**Country average vs.
International average:**

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Geometry	Investigating and Solving Problems

Angles in symmetric polygon

The line *m* is a line of symmetry for figure *ABCDE*.

The measure of angle *BCD* is

A. 30°

B. 50°

C. 60°

D. 70°

E. 110°

Item Number: D07

Overall Percent Correct

Hong Kong, SAR	82	▲
Korea, Rep. of	82	▲
Singapore	82	▲
Japan	80	▲
Bulgaria	80	▲
Latvia (LSS)	79	▲
Russian Federation	79	▲
Tunisia	77	▲
Slovak Republic	77	▲
Chinese Taipei	74	▲
Czech Republic	73	▲
Canada	72	▲
Lithuania	71	▲
Moldova	71	▲
Cyprus	69	▲
Finland	69	▲
Slovenia	66	O
Romania	66	O
Italy	65	O
Macedonia, Rep. of	65	O
Belgium (Flemish)	65	O
Netherlands	64	O
Australia	62	O
International Average	**62**	
Malaysia	59	O
Israel	58	O
Thailand	58	O
Hungary	56	▼
New Zealand	54	▼
United States	52	▼
Iran, Islamic Rep.	50	▼
England	46	▼
Jordan	44	▼
Indonesia	43	▼
Morocco	36	▼
Chile	35	▼
Turkey	35	▼
Philippines	23	▼
South Africa	19	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Geometry	Knowing

NOT true for all rectangles

Of the following, which is NOT true for all rectangles?

A. The opposite sides are parallel.

B. The opposite sides are equal.

C. All angles are right angles.

D. The diagonals are equal.

E. The diagonals are perpendicular.

Item Number: J11

Overall Percent Correct

Japan	76	▲
Tunisia	75	▲
Belgium (Flemish)	74	▲
Korea, Rep. of	73	▲
Chinese Taipei	71	▲
Russian Federation	71	▲
Hungary	69	▲
Bulgaria	68	▲
Thailand	67	▲
Latvia (LSS)	64	▲
Slovak Republic	64	▲
Slovenia	62	O
Singapore	61	O
Australia	61	O
Romania	59	O
England	58	O
Italy	56	O
Lithuania	55	O
Canada	55	O
Cyprus	54	O
Macedonia, Rep. of	54	O
International Average	**54**	
New Zealand	53	O
Hong Kong, SAR	53	O
Moldova	53	O
Malaysia	52	O
Jordan	50	O
United States	46	▼
Iran, Islamic Rep.	46	O
Netherlands	42	O
Turkey	42	▼
Israel	39	▼
Finland	38	▼
Chile	36	▼
Indonesia	34	▼
Philippines	29	▼
Czech Republic	28	▼
Morocco	27	▼
South Africa	24	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response: E

Content Domain	Cognitive Domain
Geometry	Knowing

Two similar triangles

Overall Percent Correct

Two of the triangles below are similar.

I   II   III   IV

Which two triangles are similar?

A.   I and II

B.   I and III

C.   I and IV

D.   II and IV

E.   III and IV

Item Number: J15

Japan	84	▲
Korea, Rep. of	82	▲
Singapore	76	▲
Malaysia	74	▲
Chinese Taipei	74	▲
Bulgaria	74	▲
Russian Federation	71	▲
Slovak Republic	70	O
Lithuania	69	O
Thailand	69	▲
Macedonia, Rep. of	68	O
Moldova	68	O
Latvia (LSS)	68	O
Hungary	67	O
Belgium (Flemish)	66	O
Australia	66	O
Slovenia	66	O
Romania	66	O
Czech Republic	66	O
Canada	65	O
Italy	65	O
Hong Kong, SAR	65	O
Finland	63	O
Netherlands	62	O
United States	62	O
International Average	**62**	
Iran, Islamic Rep.	61	O
England	60	O
New Zealand	57	O
Cyprus	55	O
Jordan	53	▼
Turkey	52	▼
Tunisia	48	▼
Morocco	46	▼
Chile	46	▼
Indonesia	44	▼
Israel	42	▼
Philippines	41	▼
South Africa	29	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**C**

Content Domain	Cognitive Domain
Geometry	Using Routine Procedures

Point on graph from coordinates

Which point on the graph could have coordinates (7,16)?

A. Point P

B. Point Q

C. Point R

D. Point S

Item Number: J16

Overall Percent Correct

Japan	84	▲
Korea, Rep. of	84	▲
Chinese Taipei	83	▲
Hong Kong, SAR	81	▲
Singapore	80	▲
Netherlands	78	▲
Malaysia	78	▲
Slovenia	76	▲
Slovak Republic	76	▲
England	75	▲
Australia	74	▲
Finland	72	▲
New Zealand	72	▲
Hungary	71	▲
Russian Federation	71	▲
Belgium (Flemish)	71	▲
Canada	67	▲
United States	67	▲
Lithuania	63	O
Italy	62	O
Czech Republic	58	O
International Average	**58**	
Jordan	57	O
Iran, Islamic Rep.	55	O
Bulgaria	53	O
Israel	51	O
Indonesia	50	▼
Moldova	48	▼
Romania	47	▼
Latvia (LSS)	46	▼
Macedonia, Rep. of	44	▼
Thailand	37	▼
Turkey	32	▼
Morocco	26	▼
Cyprus	24	▼
Philippines	23	▼
Chile	23	▼
South Africa	20	▼
Tunisia	10	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**D**

Content Domain	Cognitive Domain
Geometry	Investigating and Solving Problems

Measure of angle in quadrilateral

In a quadrilateral, each of two angles has a measure of 115°. If the measure of a third angle is 70°, what is the measure of the remaining angle?

A. 60°

B. 70°

C. 130°

D. 140°

E. None of the above

Item Number: L16

Overall Percent Correct

Japan	73	▲
Belgium (Flemish)	70	▲
Singapore	67	▲
Chinese Taipei	61	▲
Hong Kong, SAR	60	▲
Korea, Rep. of	56	▲
Finland	53	▲
Slovenia	53	▲
Bulgaria	49	O
Malaysia	49	▲
Russian Federation	49	O
Slovak Republic	49	O
Romania	48	O
England	43	O
Italy	41	O
Moldova	40	O
Czech Republic	40	O
International Average	**40**	
Hungary	39	O
Netherlands	39	O
Latvia (LSS)	39	O
Tunisia	38	O
Australia	36	O
Macedonia, Rep. of	36	O
Canada	36	O
Lithuania	35	O
Jordan	35	O
Israel	35	O
Cyprus	30	O
Turkey	29	▼
New Zealand	27	▼
Morocco	26	▼
Iran, Islamic Rep.	23	▼
Chile	23	▼
Thailand	22	▼
Indonesia	22	▼
United States	19	▼
South Africa	15	▼
Philippines	13	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	A

Content Domain	Cognitive Domain
Geometry	Using Routine Procedures

Position of point on number line

Point P (not shown) on the number line is 5 units from point N and 2 units from point M.

```
        0          2   3          6
   ◀────●──────────●───●──────────●────▶
        O          L   M          N
```

Where is point P located?

A.   Between O and L

B.   Between L and M

C.   Between M and N

D.   To the right of N

Item Number: N12

Overall Percent Correct

Korea, Rep. of	67	▲
Netherlands	67	▲
Japan	66	▲
Belgium (Flemish)	65	▲
Hong Kong, SAR	63	▲
Russian Federation	60	▲
Chinese Taipei	56	▲
Hungary	51	▲
Finland	51	O
Canada	50	▲
Australia	50	O
Singapore	50	O
Slovak Republic	48	O
New Zealand	47	O
Slovenia	46	O
Thailand	46	O
Czech Republic	46	O
Tunisia	44	O
International Average	**42**	
United States	42	O
Malaysia	42	O
Bulgaria	40	O
Lithuania	39	O
Moldova	39	O
Cyprus	38	O
England	36	O
Italy	34	▼
Indonesia	34	▼
Latvia (LSS)	32	▼
Israel	32	▼
Macedonia, Rep. of	31	▼
Chile	31	▼
Romania	30	▼
Iran, Islamic Rep.	27	▼
Turkey	27	▼
Philippines	26	▼
South Africa	23	▼
Jordan	20	▼
Morocco	15	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	A

Content Domain	Cognitive Domain
Geometry	Using Routine Procedures

Length of side from similar triangle

The figure represents two similar triangles. The triangles are not drawn to scale.

In the actual triangle *ABC*, what is the length of side *BC*?

A. 3.5 cm

B. 4.5 cm

C. 5 cm

D. 5.5 cm

E. 8 cm

Item Number: P10

Overall Percent Correct

Korea, Rep. of	70	▲
Japan	68	▲
Singapore	64	▲
Hong Kong, SAR	56	▲
Chinese Taipei	52	▲
Belgium (Flemish)	50	▲
Netherlands	44	O
Hungary	43	O
Russian Federation	41	O
Finland	39	O
Australia	39	O
Romania	38	O
Slovak Republic	38	O
International Average	**37**	
United States	36	O
Moldova	36	O
Canada	35	O
New Zealand	34	O
Slovenia	34	O
England	34	O
Bulgaria	33	O
Czech Republic	32	O
Malaysia	32	O
Jordan	32	O
Lithuania	31	O
Cyprus	31	O
Latvia (LSS)	30	O
Thailand	30	▼
Italy	29	▼
Israel	29	O
Macedonia, Rep. of	27	▼
Philippines	27	▼
Indonesia	26	▼
Iran, Islamic Rep.	26	▼
Tunisia	24	▼
Chile	23	▼
South Africa	23	▼
Turkey	22	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	B

Content Domain	Cognitive Domain
Geometry	Using Complex Procedures

Right triangles to cover rectangle

How many of the shaded right triangles shown above are needed to exactly cover the surface of the rectangle?

A. Four

B. Six

C. Eight

D. Ten

Item Number: R11

Overall Percent Correct

Japan	80	▲
Korea, Rep. of	76	▲
Hong Kong, SAR	75	▲
Singapore	72	▲
Belgium (Flemish)	68	▲
Netherlands	66	▲
Malaysia	60	▲
Chinese Taipei	60	▲
Hungary	59	▲
Slovenia	57	▲
Slovak Republic	57	▲
Australia	56	▲
Czech Republic	55	O
New Zealand	55	▲
Canada	50	O
Finland	49	O
Italy	49	O
England	48	O
Latvia (LSS)	48	O
United States	47	O
International Average	**46**	
Russian Federation	44	O
Lithuania	43	O
Iran, Islamic Rep.	42	O
Israel	41	O
Thailand	40	O
Cyprus	37	O
Moldova	37	▼
Romania	35	▼
Bulgaria	34	▼
Tunisia	33	▼
Turkey	30	▼
Macedonia, Rep. of	30	▼
Indonesia	29	▼
Chile	27	▼
Jordan	26	▼
Morocco	21	▼
Philippines	15	▼
South Africa	12	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Using Complex Procedures

Graph showing greatest increase

This graph shows the number of suits and coats sold each month.

According to the information in the graph, during which two-month period does the greatest increase in coat sales occur?

A.   December - January

B.   May - June

C.   June - July

D.   October - November

Item Number: B07

Overall Percent Correct

Japan	92	▲
Korea, Rep. of	90	▲
Singapore	85	▲
Hong Kong, SAR	83	▲
Netherlands	82	▲
Finland	81	▲
Chinese Taipei	79	▲
Slovenia	77	▲
Australia	76	▲
Canada	75	▲
England	74	▲
United States	73	▲
New Zealand	72	▲
Hungary	72	▲
Belgium (Flemish)	71	▲
Russian Federation	70	▲
Malaysia	68	▲
Slovak Republic	65	O
Lithuania	62	O
Latvia (LSS)	62	O
Israel	62	O
Italy	61	O
International Average	**60**	
Czech Republic	58	O
Bulgaria	55	O
Thailand	55	▼
Macedonia, Rep. of	52	▼
Turkey	42	▼
Indonesia	42	▼
Cyprus	40	▼
Chile	39	▼
Jordan	38	▼
Romania	36	▼
Philippines	36	▼
Tunisia	35	▼
Moldova	30	▼
South Africa	23	▼
Morocco	22	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

Correct Response:	D

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Knowing

Likely result of fifth coin toss

If a fair coin is tossed, the probability that it will land heads up is $\frac{1}{2}$. In four successive tosses, a fair coin lands heads up each time. What is likely to happen when the coin is tossed a fifth time?

A. It is more likely to land tails up than heads up.

B. It is more likely to land heads up than tails up.

C. It is equally likely to land heads up or tails up.

D. More information is needed to answer the question.

Item Number: F08

Overall Percent Correct

Hungary	86	▲
England	81	▲
Netherlands	79	▲
Czech Republic	77	▲
Chinese Taipei	77	▲
Australia	76	▲
Latvia (LSS)	75	▲
Canada	75	▲
Belgium (Flemish)	74	▲
Finland	71	▲
New Zealand	71	▲
Bulgaria	70	▲
Slovenia	70	▲
Lithuania	70	▲
Italy	70	▲
Slovak Republic	70	▲
Korea, Rep. of	65	▲
Russian Federation	63	O
United States	62	▲
Cyprus	60	O
Japan	58	O
International Average	**57**	
Jordan	57	O
Chile	56	O
Hong Kong, SAR	55	O
Israel	55	O
Romania	53	O
Turkey	52	O
Macedonia, Rep. of	50	▼
Singapore	48	▼
Moldova	36	▼
South Africa	34	▼
Iran, Islamic Rep.	33	▼
Philippines	29	▼
Indonesia	28	▼
Tunisia	27	▼
Morocco	24	▼
Malaysia	24	▼
Thailand	20	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response: C

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Using Complex Procedures

Barchart histogram of travel time

The graph shows the time of travel by pupils from home to school.

How many pupils must travel for MORE than 10 minutes?

A. 2

B. 5

C. 7

D. 8

E. 15

Item Number: H07

Overall Percent Correct

Korea, Rep. of	93	▲
Hong Kong, SAR	91	▲
Singapore	91	▲
Japan	84	▲
England	83	▲
Chinese Taipei	82	▲
Netherlands	82	▲
Belgium (Flemish)	82	▲
Australia	79	▲
New Zealand	79	▲
Finland	78	▲
Canada	78	▲
Slovenia	77	▲
United States	77	▲
Thailand	72	▲
Czech Republic	70	O
Hungary	69	O
Slovak Republic	65	O
International Average	**64**	
Latvia (LSS)	61	O
Moldova	60	O
Italy	59	O
Israel	59	▼
Russian Federation	59	O
Cyprus	58	▼
Lithuania	58	O
Indonesia	52	▼
Tunisia	51	▼
Philippines	51	▼
Jordan	50	▼
Turkey	49	▼
Romania	47	▼
Chile	46	▼
Malaysia	46	▼
Macedonia, Rep. of	45	▼
Iran, Islamic Rep.	38	▼
Morocco	36	▼
South Africa	21	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	**C**

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Investigating and Solving Problems

Defective bulbs from random sample

From a batch of 3,000 light bulbs, 100 were selected at random and tested. If 5 of the light bulbs in the sample were found to be defective, about how many defective light bulbs would be expected in the entire batch?

A. 15

B. 60

C. 150

D. 300

E. 600

Item Number: H11

Overall Percent Correct

Netherlands	86	▲
Hong Kong, SAR	85	▲
Chinese Taipei	83	▲
Singapore	83	▲
Korea, Rep. of	83	▲
Belgium (Flemish)	79	▲
Hungary	75	▲
Czech Republic	75	▲
Japan	73	▲
Slovenia	71	▲
Malaysia	71	▲
Slovak Republic	70	▲
Latvia (LSS)	70	▲
Finland	68	O
Canada	67	O
Russian Federation	65	O
Bulgaria	65	O
Cyprus	64	O
Australia	64	O
Thailand	64	O
International Average	**62**	
England	59	O
Tunisia	59	O
United States	58	O
Romania	56	O
Italy	56	O
New Zealand	56	O
Lithuania	56	O
Turkey	54	▼
Macedonia, Rep. of	54	▼
Moldova	53	▼
Israel	52	▼
Indonesia	49	▼
Iran, Islamic Rep.	47	▼
Chile	46	▼
Jordan	44	▼
Philippines	36	▼
Morocco	32	▼
South Africa	30	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Using Complex Procedures

Interpretation of pictograph of houses

The table shows the number of houses on two streets of a town, Konini Street and Rimu Street.

Street	Number of Houses
Konini	30
Rimu	21

The pictograph below represents the number of houses in each street.

Konini St.	⌂ ⌂ ⌂ ⌂ ⌂
Rimu St.	⌂ ⌂ ⌂ ⌂

How many houses does one ⌂ represent?

Answer: _____

Item Number: J13

SCORING

Correct Response
• 6 houses

Incorrect Response
• One house
• 5 houses
• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Singapore	95	▲
Japan	93	▲
Hong Kong, SAR	93	▲
Korea, Rep. of	89	▲
Netherlands	88	▲
Chinese Taipei	88	▲
Canada	88	▲
Australia	86	▲
Finland	86	▲
Malaysia	85	▲
England	82	▲
United States	82	▲
New Zealand	82	▲
Slovenia	81	▲
Belgium (Flemish)	80	▲
Slovak Republic	79	▲
Latvia (LSS)	79	▲
Lithuania	78	O
Thailand	77	▲
Czech Republic	76	O
Italy	74	O
Russian Federation	73	O
International Average	**69**	
Cyprus	67	O
Romania	63	O
Turkey	62	▼
Hungary	61	O
Israel	61	O
Bulgaria	58	▼
Iran, Islamic Rep.	57	▼
Tunisia	55	▼
Macedonia, Rep. of	54	▼
Chile	53	▼
Moldova	52	▼
Jordan	42	▼
Philippines	36	▼
Indonesia	31	▼
Morocco	23	▼
South Africa	14	▼

Country average vs. International average:	
Higher	▲
Not different	O
Lower	▼

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Using Complex Procedures

Graph of humidity in room

The graph below shows the humidity in a room as recorded on a certain morning.

Humidity in Room

On the morning shown in the graph, how many times between 6 a.m. and 12 noon was the humidity exactly 20 percent?

A.   One

B.   Two

C.   Three

D.   Four

Item Number: L11

Overall Percent Correct

Finland	79	▲
Japan	76	▲
Netherlands	76	▲
Chinese Taipei	73	▲
Australia	72	▲
Belgium (Flemish)	72	▲
Hungary	69	▲
Korea, Rep. of	68	▲
Singapore	68	▲
Canada	68	▲
England	68	▲
Hong Kong, SAR	68	▲
Slovak Republic	66	▲
Latvia (LSS)	65	O
Bulgaria	64	O
Lithuania	64	O
United States	63	▲
Czech Republic	63	O
Russian Federation	63	O
New Zealand	62	O
Malaysia	61	O
Israel	60	O
Tunisia	58	O
International Average	**58**	
Cyprus	57	O
Iran, Islamic Rep.	51	▼
Turkey	49	▼
Slovenia	47	▼
Chile	46	▼
Thailand	44	▼
Jordan	43	▼
Macedonia, Rep. of	43	▼
Romania	41	▼
Moldova	39	▼
Philippines	34	▼
Morocco	31	▼
Indonesia	30	▼
South Africa	29	▼
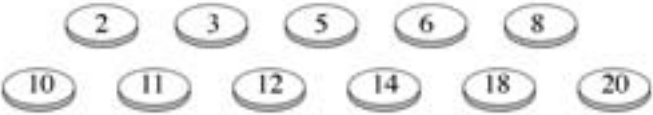
Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Investigating and Solving Problems

Probability of drawing chip

The eleven chips shown below are placed in a bag and mixed.

(2) (3) (5) (6) (8)
(10) (11) (12) (14) (18) (20)

Chelsea draws one chip from the bag without looking. What is the probability that Chelsea draws a chip with a number that is a multiple of three?

A. $\dfrac{1}{11}$

B. $\dfrac{1}{3}$

C. $\dfrac{4}{11}$

D. $\dfrac{4}{7}$

Item Number: N18

Overall Percent Correct

Korea, Rep. of	92	▲
Belgium (Flemish)	82	▲
Japan	77	▲
United States	77	▲
Canada	74	▲
England	73	▲
Australia	73	▲
Chinese Taipei	71	▲
Finland	66	▲
Hong Kong, SAR	65	▲
Netherlands	64	▲
Singapore	64	▲
Italy	61	▲
New Zealand	60	▲
Hungary	53	O
Slovenia	51	O
Cyprus	51	O
Czech Republic	49	O
Israel	49	O
International Average	**48**	
Slovak Republic	48	O
Bulgaria	46	O
Turkey	43	O
Malaysia	42	O
Indonesia	39	▼
Jordan	38	▼
Russian Federation	35	▼
Iran, Islamic Rep.	33	▼
Romania	32	▼
Chile	31	▼
Thailand	27	▼
Latvia (LSS)	27	▼
Macedonia, Rep. of	25	▼
South Africa	23	▼
Philippines	23	▼
Morocco	22	▼
Moldova	22	▼
Tunisia	21	▼
Lithuania	11	▼

Country average vs. International average:
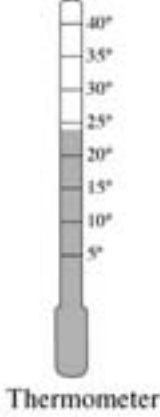
Higher	▲
Not different	O
Lower	▼

Correct Response:	C

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Using Complex Procedures

Day/time in table at shown temperature

This table shows temperatures at various times on four days.

TEMPERATURE

	6 a.m.	9 a.m.	Noon	3 p.m.	6 p.m.
Monday	15°	17°	24°	21°	16°
Tuesday	20°	16°	15°	10°	9°
Wednesday	8°	14°	16°	19°	15°
Thursday	8°	11°	19°	26°	20°

Thermometer

On which day and at what time was the temperature shown in the table the same as that shown on the thermometer?

A. Monday, Noon

B. Tuesday, 6 a.m.

C. Wednesday, 3 p.m.

D. Thursday, 3 p.m.

Item Number: P16

Overall Percent Correct

Japan	96	▲
Singapore	95	▲
Belgium (Flemish)	95	▲
Finland	93	▲
Korea, Rep. of	92	▲
England	92	▲
Chinese Taipei	91	▲
Slovenia	91	▲
Czech Republic	91	▲
Australia	91	▲
Slovak Republic	91	▲
Hong Kong, SAR	90	▲
Netherlands	90	▲
Canada	89	▲
United States	89	▲
New Zealand	88	▲
Hungary	87	▲
Cyprus	86	▲
Russian Federation	85	O
Malaysia	85	▲
Lithuania	84	O
Latvia (LSS)	83	O
Italy	81	O
International Average	**79**	
Israel	74	O
Bulgaria	72	O
Chile	67	▼
Moldova	66	▼
Romania	65	▼
Jordan	65	▼
Macedonia, Rep. of	65	▼
Iran, Islamic Rep.	59	▼
Philippines	54	▼
Indonesia	50	▼
South Africa	43	▼
Turkey	38	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	A

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Using Complex Procedures

Time for pendulum to swing 20 times

The graph shows the time taken for a pendulum to swing backwards and forwards 20 times for different lengths of the string.

Swinging Pendulum

The length of a string is 90 cm. About how long would it take for the pendulum to swing backwards and forwards 20 times?

A. 35 seconds

B. 38 seconds

C. 42 seconds

D. 45 seconds

Item Number: R09

Overall Percent Correct

Korea, Rep. of	78	▲
Japan	78	▲
Hong Kong, SAR	71	▲
Singapore	71	▲
Netherlands	70	▲
Chinese Taipei	70	▲
England	68	▲
Belgium (Flemish)	68	▲
Finland	67	▲
Australia	67	▲
Canada	66	▲
Thailand	65	▲
Slovenia	63	▲
Malaysia	62	▲
Hungary	62	▲
Slovak Republic	59	O
United States	59	O
Russian Federation	58	O
New Zealand	58	O
Lithuania	57	O
Latvia (LSS)	55	O
Israel	55	O
International Average	**54**	
Czech Republic	53	O
Bulgaria	51	O
Italy	48	O
Cyprus	46	O
Tunisia	43	▼
Romania	41	▼
Indonesia	40	▼
Jordan	40	▼
Philippines	37	▼
Chile	36	▼
Moldova	36	▼
Macedonia, Rep. of	35	▼
Morocco	35	▼
Turkey	32	▼
Iran, Islamic Rep.	31	▼
South Africa	18	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼

Correct Response:	B

Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Communicating and Reasoning

Cheaper magazine subscription

Chris plans to order 24 issues of a magazine. He reads the following advertisements for two magazines. *Ceds* are the units of currency in Chris' country.

Teen Life Magazine

24 issues
First four issues FREE
The rest
3 *ceds* each.

Teen News Magazine

24 issues
First six issues FREE
The rest
3.5 *ceds* each.

Which magazine is the least expensive for 24 issues? How much less expensive? Show your work.

Item Number: V02

SCORING

Note: There is no distinction made between responses with or without units.

Correct Response

• Teen Life. Calculations of both magazines are correct (60 ceds for Teen Life and 63 ceds for Teen News) and correct savings of 3 ceds

• Other correct (*e.g., Teen Life. Calculation of one magazine correct, the other not shown, and correct savings of 3 ceds*).

Partial Response

• Correct calculations (60 and 63 ceds), but incorrect or no magazine identified and/or no difference given

• Correct calculation for Teen News (63 ceds), but incorrect calculation for Teen Life

• Incorrect calculation for Teen News but correct calculation for Teen Life (60 ceds)

• Teen Life, 3 ceds. No work shown

• Other partially correct response (*e.g., correct calculations but incorrect difference*)

Incorrect Response

• Other incorrect (including crossed out/erased, stray marks, illegible, or off task)

Overall Percent Correct

Singapore	57	▲
Korea, Rep. of	52	▲
Chinese Taipei	50	▲
Belgium (Flemish)	42	▲
Japan	39	▲
Slovak Republic	36	▲
Slovenia	36	▲
Hungary	35	▲
Latvia (LSS)	35	▲
Hong Kong, SAR	34	▲
Czech Republic	34	▲
Canada	32	▲
Russian Federation	30	O
Australia	29	O
Finland	28	O
Italy	27	O
United States	26	O
Netherlands	25	O
Lithuania	25	O
International Average	**24**	
Bulgaria	22	O
Thailand	21	O
Cyprus	21	O
Romania	20	O
Malaysia	19	▼
Israel	19	▼
New Zealand	18	▼
Macedonia, Rep. of	17	▼
England	17	▼
Moldova	16	▼
Jordan	12	▼
Turkey	10	▼
Tunisia	9	▼
Iran, Islamic Rep.	9	▼
Chile	5	▼
Indonesia	5	▼
Philippines	3	▼
Morocco	2	▼
South Africa	1	▼

Country average vs. International average:

Higher	▲
Not different	O
Lower	▼