

# 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 1995 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 knows facts and procedures. 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 1995 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.

### 1995 Content Domains:

- Whole numbers
- Fractions and proportionality
- Measurement, estimation, and number sense
- Data representation, analysis, and probability
- Geometry
- Patterns, relations, and functions

### 2003 Content Domains:

- Patterns and Relationships
- Data
- Geometry
- Measurement
- Number

### 1995 Cognitive Domains:

- Knowing
- Performing routine procedures
- Using complex procedures
- Solving problems

### 2003 Cognitive Domains:

- Knowing facts and procedures
- Using concepts
- Solving routine problems
- Reasoning

Take a look at *Which number is it*, the name given to the first 1995 item in this book. As specified in boxes at the top of the page, the content domain for this item is *whole numbers* and the cognitive domain is *using complex procedures*. Looking at *Symbolic linear equation of magazines*, the first item from TIMSS 2003 (page 73), the content domain (*patterns and relationships*) and the cognitive domain (*solving routine problems*) are also accompanied by the main topic (*equations and formulas*).

**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. *Which number is it* provides an example of the letter code type—the correct answer is D.
- **Scoring guide.** This form is used to assist in scoring write-in responses. *Complete number sentence (S2)* further along in the *Whole Numbers* 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. fourth-grade student's response is provided for each scoring category. See Item M031249 on page 76.

**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
Whole Numbers	Using Complex Procedures

Which number is it

When you subtract one of the numbers below from 900, the answer is greater than 300. Which number is it?

- A. 823
- B. 712
- C. 667
- D. 579

### Overall Percent Correct

Korea	82	▲
Czech Republic	74	▲
Hong Kong	74	▲
Hungary	74	▲
Slovenia	72	▲
Japan	71	▲
Netherlands	70	▲
Austria	65	○
Ireland	62	○
Singapore	62	○
Latvia (LSS)	61	○

### International average 57

United States	57	○
Scotland	56	○
Thailand	54	○
Canada	53	○
Cyprus	52	○
Greece	52	○
Israel	52	○
Australia	51	○
England	48	▼
Iceland	47	○
New Zealand	47	○
Norway	43	▼
Portugal	40	▼
Iran, Islamic Rep.	39	▼
Kuwait	34	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: I3

Correct Response:

**D**

Content Domain	Cognitive Domain
Whole Numbers	Performing Routine Procedures

What is 3 times 23

What is 3 times 23?

A. 323

B. 233

C. 69

D. 26

### Overall Percent Correct

Netherlands	98	▲
Czech Republic	97	▲
Hungary	96	▲
Japan	96	▲
Hong Kong	95	▲
Latvia (LSS)	95	▲
Slovenia	95	▲
Austria	94	▲
Singapore	93	▲
United States	90	▲
England	89	○
Ireland	87	○
Australia	86	○
Greece	86	○
Korea	86	○
Canada	85	○
Scotland	85	○
<b>International average</b>	<b>84</b>	
Cyprus	82	○
Norway	82	○
Iceland	80	○
Israel	80	○
Portugal	80	○
New Zealand	78	○
Iran, Islamic Rep.	73	▼
Thailand	54	▼
Kuwait	12	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: I4

Correct Response:	C
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Content Domain	Cognitive Domain
Whole Numbers	Performing Routine Procedures

Subtraction of 4 digit numbers

Subtract:

$$\begin{array}{r} 6,000 \\ -2,369 \\ \hline \end{array}$$

A. 4,369

B. 3,742

C. 3,631

D. 3,531

**Overall Percent Correct**

Korea	93	▲
Austria	92	▲
Hungary	91	▲
Singapore	91	▲
Hong Kong	89	▲
Japan	89	▲
Netherlands	86	▲
Slovenia	86	▲
Czech Republic	83	▲
Greece	82	▲
Ireland	82	▲
Latvia (LSS)	80	▲
Cyprus	79	▲
Portugal	77	○
<b>International average</b>	<b>71</b>	
Israel	71	○
United States	71	○
Thailand	65	○
Iran, Islamic Rep.	62	○
Canada	61	▼
Norway	60	○
Scotland	55	▼
Australia	47	▼
Iceland	47	▼
Kuwait	46	▼
England	36	▼
New Zealand	30	▼

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

Item Number: I9

Correct Response:	C
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Content Domain	Cognitive Domain
Whole Numbers	Using Complex Procedures

What is the increase in product

$25 \times 18$  is more than  $24 \times 18$ . How much more?

- A. 1
- B. 18
- C. 24
- D. 25

### Overall Percent Correct

Korea	80	▲
Singapore	73	▲
Hong Kong	63	▲
Netherlands	60	▲
Japan	59	▲
Austria	58	▲
Hungary	52	○
Ireland	51	○
Slovenia	51	○
Czech Republic	50	○
Israel	47	○
United States	46	○

### International average 45

Latvia (LSS)	42	○
Australia	41	○
Canada	41	○
Cyprus	38	○
Norway	38	○
Portugal	38	○
England	37	○
Scotland	37	○
Iceland	33	▼
Thailand	33	▼
Greece	29	▼
New Zealand	28	▼
Iran, Islamic Rep.	26	▼
Kuwait	19	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: J4

Correct Response:

**B**



Content Domain	Cognitive Domain
Whole Numbers	Performing Routine Procedures

Addition of four digit numbers

Add: 
$$\begin{array}{r} 6,971 \\ +5,291 \\ \hline \end{array}$$

A. 11,162

B. 12,162

C. 12,262

D. 1,211,162

**Overall Percent Correct**

Korea	96	▲
Singapore	94	▲
Cyprus	93	▲
Czech Republic	93	▲
Japan	93	▲
Ireland	92	▲
Austria	91	▲
Slovenia	91	▲
Thailand	91	▲
Hong Kong	90	▲
Netherlands	90	▲
Canada	87	○
Hungary	86	○
Portugal	86	○
United States	86	○
Israel	85	○
Latvia (LSS)	85	○
<b>International average</b>	<b>84</b>	
Greece	81	○
Iran, Islamic Rep.	80	○
Iceland	79	○
Australia	76	▼
Norway	76	○
Scotland	73	▼
Kuwait	72	▼
New Zealand	69	▼
England	60	▼

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

Item Number: K2

Correct Response:	C
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Content Domain	Cognitive Domain
Whole Numbers	Using Complex Procedures

Which pair different by 100

In which pair of numbers is the second number 100 more than the first number?

A. 199 and 209

B. 4,236 and 4,246

C. 9,635 and 9,735

D. 51,863 and 52,863

**Overall Percent Correct**

Korea	80	▲
Japan	73	▲
Hong Kong	70	▲
Austria	68	▲
Czech Republic	67	▲
Netherlands	65	▲
Slovenia	63	▲
Hungary	62	▲
Singapore	61	▲
Israel	56	○
Cyprus	53	○
Latvia (LSS)	52	○
<b>International average</b>	<b>49</b>	
Australia	45	○
United States	45	○
Ireland	44	○
Scotland	43	○
Canada	42	○
Greece	42	○
Thailand	36	▼
Norway	35	▼
England	34	▼
New Zealand	33	▼
Portugal	31	▼
Iceland	28	▼
Kuwait	24	▼
Iran, Islamic Rep.	21	▼

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

Item Number: L7

Correct Response:	C
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Content Domain	Cognitive Domain
Whole Numbers	Knowing

Which operation equivalent

$\square$  stands for a number.  $7 \times \square$  will always give the same answer as

- A.  $\square \times 7$
- B.  $\square + 7$
- C.  $\square - 7$
- D.  $7 + \square$
- E.  $\square \div 7$

### Overall Percent Correct

Japan	89	▲
Korea	82	▲
Israel	78	▲
Singapore	78	▲
Hong Kong	75	▲
United States	71	▲
Australia	69	○
Hungary	69	○
Cyprus	67	○
Netherlands	66	○
Austria	65	○
Norway	64	○

### International average 63

England	61	○
Latvia (LSS)	61	○
Canada	60	○
Ireland	60	○
New Zealand	59	○
Scotland	58	○
Slovenia	57	○
Iran, Islamic Rep.	56	○
Thailand	55	○
Greece	54	○
Iceland	54	○
Portugal	51	▼
Czech Republic	41	▼
Kuwait	41	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: M3

Correct Response:

A

Content Domain	Cognitive Domain
Whole Numbers	Solving Problems

What to do to correct mistake

John wanted to use his calculator to add 1,463 and 319. He entered  $1,263 + 319$  by mistake. What could he do to correct his mistake?

A. Add 200.

B. Add 2.

C. Subtract 2.

D. Subtract 200.

### Overall Percent Correct

Japan	88	▲
Korea	87	▲
Hungary	84	▲
Netherlands	84	▲
Czech Republic	82	▲
Hong Kong	82	▲
Singapore	81	▲
Slovenia	80	▲
Australia	78	▲
Latvia (LSS)	78	○
Israel	77	▲
Cyprus	73	○
Ireland	72	○
Canada	71	○
England	70	○
<b>International average</b>	<b>70</b>	
United States	69	○
Norway	68	○
Scotland	66	○
New Zealand	65	○
Austria	60	○
Greece	60	▼
Iceland	59	○
Thailand	53	▼
Portugal	48	▼
Iran, Islamic Rep.	43	▼
Kuwait	38	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: M6

Correct Response:	A
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Content Domain	Cognitive Domain
Whole Numbers	Using Complex Procedures

Choose largest number

Which of these is the largest number?

A. 2,735

B. 2,537

C. 2,573

D. 2,753

### Overall Percent Correct

Korea	97	▲
Austria	95	▲
Hong Kong	95	▲
Japan	94	▲
Czech Republic	93	▲
Netherlands	93	▲
Slovenia	92	▲
Australia	91	▲
Hungary	91	▲
Israel	91	○
Singapore	91	▲
United States	89	○
Canada	88	○
Ireland	88	○
Latvia (LSS)	88	○
Greece	87	○
Norway	87	○
<b>International average</b>	<b>86</b>	
Scotland	85	○
England	83	○
New Zealand	83	○
Cyprus	82	○
Thailand	81	○
Iceland	80	○
Portugal	80	○
Iran, Islamic Rep.	63	▼
Kuwait	47	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: M8

Correct Response:	D
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Content Domain	Cognitive Domain
Whole Numbers	Performing Routine Procedures

## Complete number sentence

Here is a number sentence.

$$2,000 + \quad + 30 + 9 = 2,739$$

What number goes where the  $\quad$  is to make this sentence true?

Answer: \_\_\_\_\_

## Overall Percent Correct

Singapore	92	▲
Korea	91	▲
Japan	86	▲
Netherlands	83	▲
Hong Kong	82	▲
Slovenia	81	▲
Czech Republic	77	▲
Hungary	76	▲
Israel	71	▲
Canada	65	○
Latvia (LSS)	63	○
<b>International average</b>		<b>63</b>
Ireland	62	○
Australia	61	○
Austria	61	○
Cyprus	61	○
Portugal	60	○
Thailand	59	○
United States	58	○
Greece	52	▼
England	49	▼
New Zealand	49	▼
Scotland	47	▼
Iceland	45	▼
Norway	45	▼
Kuwait	27	▼
Iran, Islamic Rep.	26	▼

Country average vs.  
International average:

Higher	▲
Not different	○
Lower	▼

Item Number: S2

## SCORING

## Correct Response

- 700 or written out as "seven hundred."

## Incorrect Response

- 7
- 43
- 70
- Gives other numbers made by digits in 2,739 such as 73, 30, 9, 39, 739, 2,739,...
- Other incorrect.

Content Domain	Cognitive Domain
Whole Numbers	Solving Problems

Make smallest whole number

What is the smallest whole number that you can make using the digits 4, 3, 9 and 1? Use each digit only once.

Answer: \_\_\_\_\_

### Overall Percent Correct

Korea	92	▲
Singapore	72	▲
Australia	66	▲
Hong Kong	66	▲
Hungary	58	▲
Iran, Islamic Rep.	55	▲
Japan	53	▲
United States	50	▲
Canada	49	○
Ireland	49	○
<b>International average</b>	<b>43</b>	
Netherlands	43	○
Austria	41	○
Czech Republic	40	○
New Zealand	39	○
Scotland	39	○
Latvia (LSS)	38	○
England	35	▼
Cyprus	33	▼
Israel	33	▼
Greece	31	▼
Portugal	31	▼
Slovenia	30	▼
Norway	29	▼
Iceland	27	▼
Thailand	19	▼
Kuwait	10	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: T2

### SCORING

#### Correct Response

- 1,349

#### Incorrect Response

- 1,3,4,9
- 1
- 4
- 17
- Any four-digit number with digits 4,3,9 and 1, other than 1,349
- 13 OR "1 and 3" OR "3 and 1"
- Other incorrect.

Content Domain	Cognitive Domain
Whole Numbers	Knowing

Addition/multiplication task

**Addition Fact**

$$4 + 4 + 4 + 4 + 4 = 20$$

Write this addition fact as a multiplication fact.

\_\_\_\_\_ × \_\_\_\_\_ = \_\_\_\_\_

**Overall Percent Correct**

Hong Kong	95	▲
Korea	94	▲
Japan	92	▲
Singapore	90	▲
Ireland	86	▲
Israel	86	▲
Slovenia	86	▲
Netherlands	85	▲
United States	84	▲
Cyprus	83	▲
Czech Republic	83	▲
Austria	82	○
Latvia (LSS)	81	○
Hungary	80	○
Greece	79	○
<b>International average</b>	<b>77</b>	
Canada	76	○
Iran, Islamic Rep.	73	○
Australia	71	▼
New Zealand	67	▼
Norway	66	▼
Scotland	66	▼
Portugal	65	▼
Thailand	65	▼
Iceland	63	▼
England	53	▼
Kuwait	42	▼

**Country average vs. International average:**

Higher	▲
Not different	○
Lower	▼

Item Number: U5

**SCORING****Correct Response**

- $5 \times 4 = 20$
- $4 \times 5 = 20$
- Other correct

**Incorrect Response**

- $4 \times 4 = 16$
- $4 \times 4 = 20$
- $10 \times 2 = 20$  OR  $2 \times 10 = 20$
- Other incorrect

Content Domain	Cognitive Domain
Whole Numbers	Knowing

Number larger than 56,821

Write the number that is 1,000 more than 56,821.

Answer: \_\_\_\_\_

### Overall Percent Correct

Korea	85	▲
Singapore	83	▲
Japan	75	▲
Czech Republic	70	▲
Slovenia	70	▲
Hong Kong	60	▲
Austria	59	▲
United States	58	▲
Netherlands	55	○
Hungary	53	○
Ireland	53	○
Australia	51	○
Latvia (LSS)	50	○
<b>International average</b>	<b>49</b>	
Canada	47	○
Cyprus	45	○
Norway	45	○
Greece	41	▼
England	36	▼
Israel	36	▼
Scotland	35	▼
New Zealand	32	▼
Portugal	32	▼
Thailand	32	▼
Iceland	27	▼
Iran, Islamic Rep.	18	▼
Kuwait	13	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: V2

### SCORING

#### Correct Response

- 57,821

#### Incorrect Response

- 66,821
- Any number except 66,821 where one or more digits in 56,821 have been increased by 1.  
*Example: 56,921, 66,932, 57,921*
- Other incorrect.



Content Domain	Cognitive Domain
Whole Numbers	Performing Routine Procedures

What is 5 less than 203

What is 5 less than 203?

Answer: \_\_\_\_\_

### Overall Percent Correct

Korea	89	▲
Austria	84	▲
Singapore	82	▲
Japan	81	▲
Slovenia	79	▲
Hungary	78	▲
Czech Republic	77	▲
Ireland	75	▲
Hong Kong	74	▲
Australia	71	▲
Netherlands	67	○
Scotland	67	▲
Norway	64	○
United States	64	○
<b>International average</b>	<b>62</b>	
England	61	○
Canada	60	○
Latvia (LSS)	59	○
Cyprus	57	○
Israel	56	○
New Zealand	51	▼
Iceland	50	▼
Greece	48	▼
Thailand	39	▼
Portugal	34	▼
Iran, Islamic Rep.	33	▼
Kuwait	10	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: V3

## SCORING

### Correct Response

- 198

### Incorrect Response

- 98 OR 298
- 5
- 208
- Other incorrect

<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Whole Numbers</b>	<b>Solving Problems</b>

Game with cards: who won? Explain

In a game, Mysong and Naoki are making problems. They each have four cards like these.

The winner of the game is the person who can make the problem with the largest answer.

Mysong placed the cards like this.

4	3
+	2
1	

Naoki placed the cards like this.

3	1
+	2
4	

Who won this game? \_\_\_\_\_  
 How do you know? \_\_\_\_\_

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Write numbers in the squares below to show how you would place the cards to beat both Mysong and Naoki.

+	

**Overall Percent Correct**

Korea	63	▲
Slovenia	45	▲
Hungary	41	▲
Israel	41	▲
Canada	38	▲
Japan	36	▲
Portugal	32	▲
Singapore	29	▲
Cyprus	27	○
Greece	27	○
<b>International average</b>	<b>24</b>	
Austria	23	○
United States	23	○
Australia	22	○
Czech Republic	22	○
Netherlands	22	○
Hong Kong	21	○
Iceland	21	○
Ireland	20	○
Iran, Islamic Rep.	17	▼
New Zealand	13	▼
Scotland	12	▼
England	11	▼
Latvia (LSS)	11	▼
Norway	6	▼
Kuwait	1	▼
Thailand	0	▼

<b>Country average vs. International average:</b>	
Higher	▲
Not different	○
Lower	▼

Item Number: V4A

**SCORING**

**Scoring for Part a**

**Correct Response**

- Mysong. 64 and 55 are shown (or 9, which is the difference between 64 and 55) with a correct verbal explanation.

**Partially Correct**

- Mysong. 64 and 55 are shown (or  $43 - 31 > 24 - 21$ ) with an unsatisfactory explanation.
- Mysong. 64 and 55 are shown (or  $43 - 31 > 24 - 21$ ) without any further explanation.
- Mysong. The response given is a verbal explanation. Either 64 or 55 is shown but not both.
- Mysong. The response gives no verbal or numeric explanation.
- Other responses containing Mysong. For example, "because Mysong had the largest answer."

**Incorrect Response**

- Neither Mysong nor Naoki win.
- Naoki. There may or may not be an explanation.
- Other incorrect, including "both won."

<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Whole Numbers</b>	<b>Solving Problems</b>

Game with cards: winning numbers

In a game, Mysong and Naoki are making problems. They each have four cards like these.



The winner of the game is the person who can make the problem with the largest answer.

Mysong placed the cards like this.

$$\begin{array}{r} 43 \\ + 21 \\ \hline \end{array}$$

Naoki placed the cards like this.

$$\begin{array}{r} 31 \\ + 24 \\ \hline \end{array}$$

Who won this game? \_\_\_\_\_  
 How do you know? \_\_\_\_\_  
 \_\_\_\_\_

Write numbers in the squares below to show how you would place the cards to beat both Mysong and Naoki.

$$\begin{array}{r} \square \square \\ + \square \square \\ \hline \end{array}$$

**Overall Percent Correct**

Hong Kong	82	▲
Japan	81	▲
Singapore	70	▲
Korea	66	▲
Netherlands	62	▲
Hungary	59	▲
Slovenia	57	▲
United States	57	▲
Canada	55	○
Australia	54	▲
Austria	53	○
Israel	53	○
England	50	○
Scotland	48	○
<b>International average</b>	<b>48</b>	
Greece	46	○
Ireland	46	○
Czech Republic	43	○
New Zealand	42	○
Norway	41	○
Latvia (LSS)	39	▼
Iceland	35	▼
Cyprus	34	▼
Portugal	29	▼
Iran, Islamic Rep.	18	▼
Thailand	18	▼
Kuwait	5	▼

**Country average vs. International average:**

Higher	▲
Not different	○
Lower	▼

Item Number: V4B

**SCORING**

**Scoring for Part b**

**Correct Response**

- One of the following: 42+31; 41+32; 31+42; or 32+41

**Incorrect Response**

- Combinations of the numbers 1, 2, 3 and 4. Every number is used only once.
- Combinations of the numbers 1, 2, 3 and 4. One or more numbers are used more than once.
- Combinations containing one or more numbers other than 1, 2, 3 and 4
- Other incorrect

Content Domain	Cognitive Domain
Fractions and Proportionality	Knowing

0.4 is the same as

0.4 is the same as

A. four

B. four tenths

C. four hundredths

D. one-fourth

### Overall Percent Correct

Portugal	90	▲
Singapore	90	▲
Hong Kong	78	▲
Japan	73	▲
Korea	70	▲
Cyprus	61	▲
Ireland	55	▲
Iran, Islamic Rep.	54	▲
Australia	49	▲
United States	40	○

<b>International average</b>	<b>39</b>	
Canada	31	○
Hungary	31	○
Greece	29	▼
Netherlands	29	○
Scotland	28	▼
Thailand	26	▼
Austria	24	▼
Czech Republic	22	▼
Kuwait	22	▼
England	20	▼
New Zealand	20	▼
Israel	18	▼
Latvia (LSS)	17	▼
Slovenia	16	▼
Norway	14	▼
Iceland	9	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: I2

Correct Response:	<b>B</b>
-------------------	----------

Content Domain	Cognitive Domain
Fractions and Proportionality	Using Complex Procedures

Sauce from 15 tomatoes

Mario uses 5 tomatoes to make half a liter of tomato sauce. How much sauce can he make from 15 tomatoes?

A. A liter and a half

B. Two liters

C. Two liters and a half

D. Three liters

**Overall Percent Correct**

Hong Kong	73	▲
Korea	67	▲
Netherlands	67	▲
Czech Republic	64	▲
Slovenia	61	○
Hungary	60	○
Israel	60	○
Singapore	60	▲
Australia	59	○
Thailand	57	○
Ireland	56	○
Latvia (LSS)	53	○
<b>International average</b>	<b>53</b>	
Austria	51	○
Cyprus	51	○
England	51	○
Norway	51	○
Greece	50	○
New Zealand	48	○
Scotland	46	○
Japan	45	○
Iceland	44	○
Iran, Islamic Rep.	44	▼
United States	43	▼
Portugal	42	▼
Canada	41	▼
Kuwait	23	▼

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


Item Number: 15

Correct Response:	A
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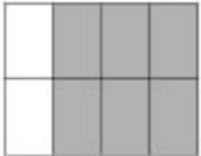
Content Domain	Cognitive Domain
Fractions and Proportionality	Using Complex Procedures

Which 2 figures represent same fraction

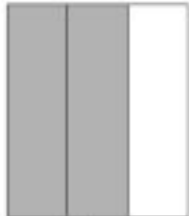
Each figure represents a fraction.



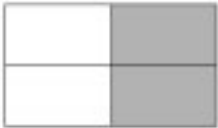
1



2



3



4

Which two figures represent the same fraction?

A. 1 and 2

B. 1 and 4

C. 2 and 3

D. 3 and 4

**Overall Percent Correct**

Singapore	72	▲
Austria	71	▲
Iceland	69	▲
Hong Kong	67	▲
Slovenia	64	▲
Netherlands	59	○
Japan	58	○
England	57	○
Korea	57	○
Cyprus	56	○
Norway	55	○
<b>International average</b>	<b>54</b>	
Israel	53	○
Latvia (LSS)	53	○
Canada	52	○
United States	52	○
Hungary	51	○
Ireland	51	○
Greece	50	○
New Zealand	50	○
Czech Republic	47	○
Scotland	46	○
Australia	44	▼
Thailand	43	○
Portugal	42	▼
Iran, Islamic Rep.	40	▼
Kuwait	38	▼

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

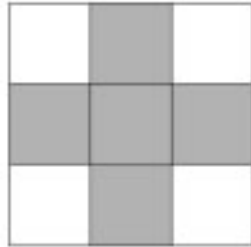
Item Number: 18

Correct Response:	<b>A</b>
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Content Domain	Cognitive Domain
Fractions and Proportionality	Solving Problems

Fraction of figure shaded

Part of the figure is shaded.



What fraction of the figure is shaded?

- A.  $\frac{5}{4}$
- B.  $\frac{4}{5}$
- C.  $\frac{6}{9}$
- D.  $\frac{5}{9}$

### Overall Percent Correct

Hong Kong	96	▲
Singapore	94	▲
Korea	92	▲
Japan	89	▲
United States	80	▲
Canada	79	▲
Ireland	79	▲
Cyprus	75	▲
Thailand	75	▲
Australia	72	▲
Netherlands	70	▲
Iran, Islamic Rep.	68	○
Scotland	66	○
Israel	62	○

### International average 61

Greece	58	○
Hungary	58	○
New Zealand	50	○
England	48	▼
Latvia (LSS)	48	▼
Slovenia	47	▼
Austria	45	▼
Czech Republic	43	▼
Norway	25	▼
Kuwait	21	▼
Iceland	20	▼
Portugal	16	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: J7

Correct Response:

D

Content Domain	Cognitive Domain
Fractions and Proportionality	Using Complex Procedures

How many marbles in two bags

There are 54 marbles, and they are put into 6 bags, so that the same number of marbles is in each bag. How many marbles would 2 bags contain?

- A. 108 marbles
- B. 18 marbles
- C. 15 marbles
- D. 12 marbles
- E. 9 marbles

### Overall Percent Correct

Singapore	76	▲
Czech Republic	60	▲
Austria	59	▲
Korea	54	▲
Netherlands	51	▲
Japan	49	▲
Hong Kong	47	▲
Slovenia	47	○
Latvia (LSS)	45	○
Hungary	44	○
Ireland	44	○
Australia	38	○
<b>International average</b>	<b>38</b>	
United States	36	○
England	35	○
Israel	34	○
New Zealand	33	○
Scotland	33	○
Canada	29	▼
Portugal	26	▼
Thailand	25	▼
Cyprus	23	▼
Greece	23	▼
Kuwait	20	▼
Iceland	19	▼
Iran, Islamic Rep.	14	▼
Norway	12	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

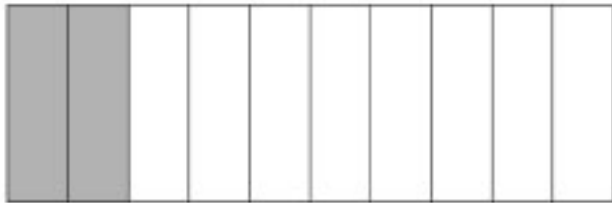
Item Number: K9

Correct Response:	<b>B</b>
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Content Domain	Cognitive Domain
Fractions and Proportionality	Knowing

Decimal representing shaded part of figure



Which number represents the shaded part of the figure?

- A. 2.8
- B. 0.5
- C. 0.2
- D. 0.02

**Overall Percent Correct**

Singapore	81	▲
Hong Kong	73	▲
Japan	71	▲
Portugal	71	▲
Korea	67	▲
Ireland	48	○
Cyprus	41	○
<b>International average 40</b>		
Australia	40	○
Canada	40	○
Iran, Islamic Rep.	35	○
Thailand	35	○
Austria	34	○
England	34	○
Scotland	34	○
Kuwait	32	○
Netherlands	32	○
United States	32	▼
Czech Republic	31	▼
Hungary	31	▼
Greece	30	▼
Latvia (LSS)	30	▼
Slovenia	29	▼
Israel	28	▼
New Zealand	25	▼
Iceland	23	▼
Norway	19	▼

**Country average vs. International average:**

- Higher ▲
- Not different ○
- Lower ▼

Item Number: M5

<b>Correct Response:</b>	<b>C</b>
--------------------------	----------

Content Domain	Cognitive Domain
Fractions and Proportionality	Solving Problems

## Longest box on shelf

Julie put a box on a shelf that is 96.4 centimeters long. The box is 33.2 centimeters long. What is the longest box she could put on the rest of the shelf?  
Show all your work.

Answer: \_\_\_\_\_

## Overall Percent Correct

Singapore	61	▲
Korea	53	▲
Japan	40	▲
Czech Republic	38	▲
Slovenia	33	○
Hong Kong	32	○
Thailand	32	○
United States	32	▲
Austria	31	○
Ireland	29	○
Netherlands	28	○
Scotland	27	○
<b>International average</b>	<b>26</b>	
Canada	25	○
Israel	25	○
Australia	23	○
England	22	○
Greece	21	○
Norway	19	▼
Latvia (LSS)	18	▼
Cyprus	16	▼
Portugal	15	▼
Hungary	13	▼
New Zealand	13	▼
Iran, Islamic Rep.	9	▼
Iceland	6	▼
Kuwait	5	▼

Country average vs.  
International average:

Higher	▲
Not different	○
Lower	▼

Item Number: S3

## SCORING

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

## Correct Response

- 63.2. The calculation will be "96.4 - 33.2" or its equivalent.

## Partially Correct

- 63.2. No acceptable description or calculation is shown.
- The calculation "96.4 - 33.2," or equivalent, is shown but the answer is incorrect.
- Other partial.

## Incorrect Response

- Any incorrect numerical answers (answers not equal to 63.2). No acceptable description or calculation is shown.
- Other incorrect.

Content Domain	Cognitive Domain
Fractions and Proportionality	Solving Problems

How many pupils in class

A teacher marks 10 of her pupils' tests every half hour. It takes her one and one-half hours to mark all her pupils' tests. How many pupils are in her class?

Answer: \_\_\_\_\_

### Overall Percent Correct

Netherlands	73	▲
Japan	70	▲
Korea	69	▲
Singapore	63	▲
Ireland	58	▲
Czech Republic	57	▲
Israel	57	▲
Australia	56	▲
Hong Kong	55	▲
Austria	53	○
England	53	▲
Scotland	52	○
Slovenia	51	○
New Zealand	47	○
<b>International average</b>	<b>46</b>	
Latvia (LSS)	46	○
United States	45	○
Canada	44	○
Hungary	42	○
Cyprus	37	▼
Iceland	37	▼
Greece	31	▼
Norway	27	▼
Thailand	26	▼
Portugal	25	▼
Iran, Islamic Rep.	18	▼
Kuwait	11	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: S4

### SCORING

#### Correct Response

- 30

#### Incorrect Response

- 10
- 15
- 20
- 21
- 25
- 40
- Other incorrect.

Content Domain	Cognitive Domain
Fractions and Proportionality	Solving Problems

Girl/boy ratio: is Juanita right

There are 10 girls and 20 boys in Juanita's class. Juanita said that there is one girl for every two boys. Her friend Amanda said that means  $\frac{1}{2}$  of all the students in the class are girls.

How many students are there in Juanita's class?

Answer: \_\_\_\_\_

Is Juanita right? Answer: \_\_\_\_\_

Use words or pictures to explain why.

Is Amanda right? Answer: \_\_\_\_\_

Use words and pictures to explain why.

### Overall Percent Correct

Korea	43	▲
Singapore	41	▲
Netherlands	38	▲
Australia	34	▲
England	30	▲
Japan	30	▲
Ireland	26	○
Scotland	26	○
Czech Republic	25	○
New Zealand	25	○
United States	25	○
Norway	24	○
Slovenia	24	○
Canada	22	○
<b>International average</b>	<b>21</b>	
Cyprus	21	○
Israel	19	○
Austria	13	▼
Greece	11	▼
Hong Kong	11	▼
Latvia (LSS)	9	▼
Portugal	9	▼
Iran, Islamic Rep.	7	▼
Kuwait	7	▼
Iceland	5	▼
Thailand	4	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: T4A

## SCORING

### Scoring for Part a

#### Correct Response

- YES. The response expresses verbally, symbolically or pictorially that 20 is twice as much as 10, or that 10 is half of 20.
- Other correct. (Includes satisfactory explanations when neither a "yes" or "no" answer is given).

#### Incorrect Response

- NO. An explanation is given but is not satisfactory.
- NO. No explanation is given.
- YES. An explanation is given but is not satisfactory.
- YES. No explanation is given.
- Other incorrect.

Content Domain	Cognitive Domain
Fractions and Proportionality	Solving Problems

Girl/boy ratio: is Amanda right

There are 10 girls and 20 boys in Juanita's class. Juanita said that there is one girl for every two boys. Her friend Amanda said that means  $\frac{1}{2}$  of all the students in the class are girls.

How many students are there in Juanita's class?

Answer: \_\_\_\_\_

Is Juanita right? Answer: \_\_\_\_\_

Use words or pictures to explain why.

Is Amanda right? Answer: \_\_\_\_\_

Use words and pictures to explain why.

### Overall Percent Correct

Singapore	37	▲
Korea	32	▲
Japan	30	▲
Ireland	25	▲
Netherlands	24	▲
Australia	21	▲
England	20	▲
Czech Republic	18	○
United States	17	○
Israel	16	○
Scotland	16	○
New Zealand	15	○
Norway	15	○
<b>International average</b>	<b>15</b>	
Hong Kong	13	○
Canada	12	○
Cyprus	12	○
Slovenia	12	○
Greece	8	▼
Latvia (LSS)	6	▼
Austria	5	▼
Iceland	5	▼
Kuwait	4	▼
Thailand	4	▼
Portugal	3	▼
Iran, Islamic Rep.	1	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: T4B

## SCORING

### Scoring for Part b

#### Correct Response

- NO. The response expresses verbally, symbolically or pictorially that 10 is not half of 30.
- Other correct. (Includes satisfactory explanations when neither a "yes" or "no" answer is given).

#### Incorrect Response

- YES. An explanation is given but it is not satisfactory.
- YES. No explanation is given.
- NO. An explanation is given but it is not satisfactory.
- NO. No explanation is given.
- Other incorrect.

Content Domain	Cognitive Domain
Fractions and Proportionality	Knowing

Fraction larger than  $2/7$

Write a fraction that is larger than  $\frac{2}{7}$ .

Answer: \_\_\_\_\_

### Overall Percent Correct

Korea	90	▲
Hong Kong	84	▲
Japan	78	▲
Singapore	76	▲
Ireland	74	▲
Thailand	73	▲
Cyprus	69	▲
United States	68	▲
Israel	65	○
Hungary	63	○
Canada	62	○
Czech Republic	60	○
Australia	59	○
<b>International average</b>	<b>57</b>	
Greece	56	○
Austria	55	○
England	55	○
Scotland	54	○
New Zealand	51	○
Netherlands	50	▼
Latvia (LSS)	45	▼
Iran, Islamic Rep.	41	▼
Slovenia	39	▼
Norway	38	▼
Kuwait	30	▼
Portugal	28	▼
Iceland	27	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: U2

## SCORING

### Correct Response

- A fraction with numerator greater than 2 and denominator equal to 7
- A fraction with numerator equal to 2 and denominator less than 7
- $3/8$
- $1/2$ . (Other fractions with numeric value equal  $1/2$  should be scored as correct.)
- Other correct fraction.

### Incorrect Response

- $1/7$
- $4/14$
- $2/8$
- Other incorrect

Content Domain	Cognitive Domain
Fractions and Proportionality	Solving Problems

Bicycle ride: how long, Maria

Maria and her sister Louisa leave home at the same time and ride their bicycles to school 9 kilometers away.

Maria rides at a rate of 3 kilometers in 10 minutes. How long will it take her to get to school?

Answer: \_\_\_\_\_ minutes

Louisa rides at a rate of 1 kilometer in 3 minutes. How long will it take her to get to school?

Answer: \_\_\_\_\_ minutes

Who arrives at school first?

Answer: \_\_\_\_\_

### Overall Percent Correct

Netherlands	81	▲
Hong Kong	79	▲
Japan	76	▲
Korea	76	▲
Czech Republic	75	▲
Singapore	74	▲
Slovenia	68	▲
Australia	67	▲
Austria	67	○
Ireland	67	○
Hungary	63	○
United States	62	○

#### International average 61

Canada	61	○
Cyprus	61	○
Norway	61	○
England	60	○
Israel	60	○
Latvia (LSS)	60	○
New Zealand	60	○
Iceland	58	○
Scotland	57	○
Thailand	54	○
Greece	53	○
Portugal	46	▼
Iran, Islamic Rep.	24	▼
Kuwait	17	▼

#### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: U3A

### SCORING

#### Scoring for Part a

##### Correct Response

- 30

##### Incorrect Response

- 10
- Other incorrect.

Content Domain	Cognitive Domain
Fractions and Proportionality	Solving Problems

Bicycle ride: how long, Louisa

Maria and her sister Louisa leave home at the same time and ride their bicycles to school 9 kilometers away.

Maria rides at a rate of 3 kilometers in 10 minutes. How long will it take her to get to school?

Answer: \_\_\_\_\_ minutes

Louisa rides at a rate of 1 kilometer in 3 minutes. How long will it take her to get to school?

Answer: \_\_\_\_\_ minutes

Who arrives at school first?

Answer: \_\_\_\_\_

### Overall Percent Correct

Hong Kong	70	▲
Singapore	69	▲
Korea	64	▲
Czech Republic	62	▲
Netherlands	62	▲
Austria	61	▲
Japan	61	▲
Slovenia	61	▲
Australia	49	○
Hungary	49	○
Ireland	47	○
Latvia (LSS)	47	○
Scotland	45	○
<b>International average</b>	<b>45</b>	
United States	44	○
Israel	43	○
Norway	43	○
Canada	42	○
England	40	○
New Zealand	36	▼
Iceland	33	○
Thailand	32	▼
Cyprus	29	▼
Greece	29	▼
Portugal	25	▼
Iran, Islamic Rep.	11	▼
Kuwait	7	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: U3B

## SCORING

### Scoring for Part b

#### Correct Response

- 27

#### Incorrect Response

- Any other multiple of 3.
- Other incorrect.



Content Domain	Cognitive Domain
Fractions and Proportionality	Solving Problems

Bicycle ride: who arrived first

Maria and her sister Louisa leave home at the same and ride their bicycles to school 9 kilometers away.

Maria rides at a rate of 3 kilometers in 10 minutes. How long will it take her to get to school?

Answer: \_\_\_\_\_ minutes

Louisa rides at a rate of 1 kilometer in 3 minutes. How long will it take her to get to school?

Answer: \_\_\_\_\_ minutes

Who arrives at school first?

Answer: \_\_\_\_\_

### Overall Percent Correct

Netherlands	90	▲
Singapore	86	▲
Japan	85	▲
Czech Republic	84	▲
Ireland	83	▲
Slovenia	82	▲
United States	82	▲
Austria	81	▲
Hong Kong	81	▲
Scotland	80	▲
Australia	79	▲
Canada	79	▲
Hungary	79	▲
Korea	76	○
England	75	○
New Zealand	75	○
Norway	73	○
<b>International average</b>	<b>73</b>	
Israel	71	○
Cyprus	70	○
Iceland	66	○
Latvia (LSS)	66	○
Thailand	66	○
Greece	63	▼
Portugal	62	▼
Iran, Islamic Rep.	33	▼
Kuwait	28	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: U3C

## SCORING

### Scoring for Part c

#### Correct Response

- Louisa
- Maria (or other responses), in cases where the response is consistent with (a) and (b).

#### Incorrect Response

- Inconsistent with part (a) or (b) or both.
- Other incorrect

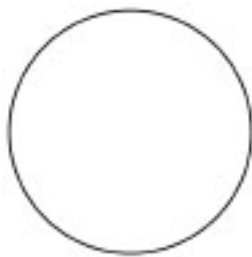
Content Domain	Cognitive Domain
Fractions and Proportionality	Solving Problems

## Fractions of pie

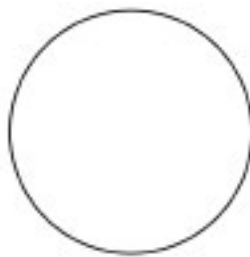
Sam said that  $\frac{1}{3}$  of a pie is less than  $\frac{1}{4}$  of the same pie.

Is Sam correct? \_\_\_\_\_

Use the circles below to show why this is so.



Shade in  $\frac{1}{3}$   
of this circle



Shade in  $\frac{1}{4}$   
of this circle

## Overall Percent Correct

Singapore	58	▲
Netherlands	56	▲
Hong Kong	47	▲
Japan	41	▲
Korea	41	▲
Israel	39	▲
Hungary	33	○
Czech Republic	31	○
Ireland	30	○
Austria	27	○
United States	27	○

**International average 26**

Slovenia	26	○
Australia	24	○
Latvia (LSS)	24	○
Iceland	22	○
Canada	20	○
Cyprus	20	▼
England	20	▼
Scotland	20	▼
New Zealand	16	▼
Norway	16	▼
Greece	14	▼
Thailand	14	▼
Kuwait	6	▼
Portugal	6	▼
Iran, Islamic Rep.	3	▼

**Country average vs.  
International average:**

Higher	▲
Not different	○
Lower	▼

Item Number: V1

### SCORING

Note: The partition of circles has priority over shading. This is reflected in the scoring guide below.

#### Correct Response

- NO. Both circles are correctly partitioned.

#### Partially Correct

- NO. No partitioning is shown.
- NO. Only one of the circles correctly partitioned.
- NO. Other incorrect ways of partitioning.
- YES, or there is no conclusion stated. Both circles are correctly partitioned.
- Other partial.

#### Incorrect Response

- YES. No partitioning is shown.
- YES. The part representing  $\frac{1}{3}$  is made consistently smaller than the part representing  $\frac{1}{4}$ .
- YES. Other responses where one or both of the circles partitioned into 3 and/or 4 parts.
- Other incorrect.

Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Solving Problems

Choose largest mass

Which of these is largest?

A. 1 kilogram

B. 1 centigram

C. 1 milligram

D. 1 gram

### Overall Percent Correct

Japan	94	▲
Netherlands	92	▲
Hungary	91	▲
Korea	90	▲
Austria	89	▲
Hong Kong	89	▲
Slovenia	89	▲
Czech Republic	81	▲
Portugal	79	▲
Latvia (LSS)	77	○
Singapore	76	○
Norway	74	○
Australia	73	○
Thailand	73	○
<b>International average</b>	<b>72</b>	
Greece	71	○
Iceland	71	○
Canada	68	○
Kuwait	67	○
England	62	▼
United States	61	▼
New Zealand	58	▼
Ireland	56	▼
Scotland	55	▼
Iran, Islamic Rep.	53	▼
Israel	50	▼
Cyprus	21	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: J6

Correct Response:	A
-------------------	---

Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Knowing

Which is best estimate of hours

Elena worked 57 hours in March, 62 hours in April, and 59 hours in May. Which of these is the BEST estimate of the total number of hours she worked for the three months?

A.  $50 + 50 + 50$

B.  $55 + 55 + 55$

C.  $60 + 60 + 60$

D.  $65 + 65 + 65$

### Overall Percent Correct

Singapore	80	▲
Korea	78	▲
Japan	75	▲
Hong Kong	72	▲
United States	71	▲
Israel	66	▲
Netherlands	66	▲
Canada	65	▲
Austria	61	○
Czech Republic	61	▲
Hungary	60	▲
Australia	58	○
Ireland	58	○
<b>International average</b>	<b>52</b>	
Scotland	47	○
England	46	○
Slovenia	45	○
New Zealand	42	○
Norway	40	▼
Latvia (LSS)	39	▼
Cyprus	38	▼
Iceland	35	▼
Portugal	34	▼
Greece	32	▼
Thailand	28	▼
Iran, Islamic Rep.	23	▼
Kuwait	20	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼


Item Number: J8

Correct Response:	C
-------------------	---

Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Using Complex Procedures

Estimate pencil length

About how long is this picture of a pencil?



A drawing of a pencil, oriented horizontally. The pencil is sharpened at the left end and has a small eraser at the right end. The drawing is a simple line drawing with shading to indicate the three-dimensional shape of the pencil.

A. 5 cm  
 B. 10 cm  
 C. 20 cm  
 D. 30 cm

**Overall Percent Correct**

Czech Republic	91	▲
Hong Kong	91	▲
Singapore	91	▲
Austria	89	▲
Japan	88	▲
Cyprus	86	▲
Korea	85	▲
Latvia (LSS)	85	○
Slovenia	84	○
Thailand	84	○
Ireland	79	○
Norway	79	○
Hungary	78	○
Australia	77	○
Netherlands	77	○
<b>International average</b>	<b>77</b>	
Canada	72	○
New Zealand	71	○
Scotland	69	○
England	68	○
Iceland	68	○
Kuwait	67	▼
Iran, Islamic Rep.	66	▼
Israel	66	▼
Portugal	66	▼
Greece	63	○
United States	55	▼

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

Item Number: K5

Correct Response:	<b>B</b>
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Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Performing Routine Procedures

Length of rectangle

A thin wire 20 centimeters long is formed into a rectangle. If the width of this rectangle is 4 centimeters, what is its length?

A. 5 centimeters

B. 6 centimeters

C. 12 centimeters

D. 16 centimeters

### Overall Percent Correct

Singapore	46	▲
Korea	38	▲
Netherlands	35	▲
Japan	32	▲
England	29	○
Hong Kong	29	○
Cyprus	28	○
Latvia (LSS)	24	○
Scotland	24	○
<b>International average</b>	<b>23</b>	
Australia	23	○
Austria	23	○
Canada	23	○
New Zealand	23	○
United States	23	○
Kuwait	22	○
Ireland	20	○
Slovenia	20	○
Norway	19	○
Portugal	18	○
Israel	17	○
Czech Republic	16	▼
Greece	16	○
Iran, Islamic Rep.	16	▼
Hungary	15	▼
Thailand	15	▼
Iceland	12	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: K7

Correct Response:	<b>B</b>
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Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Solving Problems

Best estimate of clothespin mass

The weight (mass) of a clothespin is 9.2 g. Which of these is the best estimate of the total weight (mass) of 1,000 clothespins?

A. 900 g

B. 9,000 g

C. 90,000 g

D. 900,000 g

### Overall Percent Correct

Czech Republic	74	▲
Hong Kong	71	▲
Hungary	71	▲
Netherlands	71	▲
Slovenia	71	▲
Korea	67	▲
Austria	65	▲
Israel	62	○
Singapore	59	○
Latvia (LSS)	57	○
<b>International average</b>	<b>55</b>	
Greece	55	○
Australia	53	○
Ireland	52	○
United States	52	○
Canada	50	○
Scotland	50	○
Thailand	50	○
Norway	49	○
England	47	○
Kuwait	45	▼
Cyprus	44	▼
Iceland	44	▼
Portugal	43	▼
New Zealand	42	▼
Iran, Islamic Rep.	38	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: L6

Correct Response:	<b>B</b>
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Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Solving Problems

Who had the longest pace

Four children measured the width of a room by counting how many paces it took them to cross it. The chart shows their measurements.

Name	Number of Paces
Stephen	10
Erlane	8
Ana	9
Carlos	7

Who had the longest pace?

- A. Stephen
- B. Erlane
- C. Ana
- D. Carlos

**Overall Percent Correct**

Korea	65	▲
Netherlands	61	▲
Austria	55	▲
Slovenia	54	▲
Latvia (LSS)	48	▲
Czech Republic	46	▲
Japan	45	▲
Hong Kong	42	▲
Ireland	39	○
Iceland	35	○
Norway	35	○

<b>International average</b>	<b>32</b>	
England	27	○
Hungary	27	○
Israel	27	○
Portugal	27	○
Greece	25	○
Singapore	25	▼
Scotland	23	▼
Australia	21	▼
Cyprus	21	▼
New Zealand	21	▼
Canada	19	▼
Thailand	15	▼
United States	10	▼
Iran, Islamic Rep.	8	▼
Kuwait	8	▼

**Country average vs. International average:**

Higher	▲
Not different	○
Lower	▼

Item Number: L8

<b>Correct Response:</b>	<b>D</b>
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Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Knowing

Substance measured in milliliters

Which of these would most likely be measured in milliliters?

A. The amount of liquid in a teaspoon

B. The weight (mass) of a pin

C. The amount of gasoline in a tank

D. The thickness of 10 sheets of paper

### Overall Percent Correct

Japan	75	▲
Hong Kong	73	▲
Hungary	55	▲
Austria	51	▲
Australia	45	▲
Portugal	45	○
Singapore	45	▲
Slovenia	45	○
Ireland	44	○
Latvia (LSS)	42	○
United States	38	○
<b>International average</b>	<b>38</b>	
England	37	○
New Zealand	35	○
Scotland	35	○
Czech Republic	32	○
Canada	31	○
Korea	31	○
Iceland	29	○
Israel	28	○
Greece	27	▲
Netherlands	27	▼
Iran, Islamic Rep.	26	▼
Norway	24	▼
Thailand	22	▼
Cyprus	20	▼
Kuwait	15	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼


Item Number: M7

Correct Response:	<b>A</b>
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Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Using Complex Procedures


How many paper clip lengths

Here is a paper clip.



← Length →

About how many lengths of the paper clip is the same as the length of this line?



Answer: \_\_\_\_\_

**Overall Percent Correct**

Japan	68	▲
Korea	67	▲
Austria	65	▲
Netherlands	61	▲
Ireland	60	▲
Norway	60	▲
Australia	58	▲
England	58	▲
Hungary	57	▲
Scotland	57	▲
Czech Republic	56	▲
Canada	54	▲
United States	53	▲
Hong Kong	52	○
<b>International average</b>	<b>48</b>	
Singapore	47	○
Iceland	46	○
New Zealand	45	○
Slovenia	43	○
Cyprus	37	▼
Latvia (LSS)	37	▼
Greece	36	▼
Israel	35	▼
Thailand	33	▼
Portugal	29	▼
Iran, Islamic Rep.	19	▼
Kuwait	14	▼

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

Item Number: S5

**SCORING**

**Correct Response**

- 4.
- 5.
- Within the interval  $4 < X < 5.5$ .

**Incorrect Response**

- Less than 3.
- Within the interval  $3 < X < 4$ .
- Within the interval  $5.5 < X < 6.5$ .
- Within the interval  $6.5 < X < 8$ .
- Other incorrect.

Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Performing Routine Procedures

When did Mr. Brown start walk

Mr. Brown goes for a walk and returns to where he started at 07:00. If his walk took 1 hour and 30 minutes, at what time did he start his walk?

Answer: \_\_\_\_\_

### Overall Percent Correct

Korea	74	▲
Netherlands	72	▲
Austria	64	▲
Czech Republic	63	▲
Australia	62	▲
Japan	60	▲
Norway	60	▲
Latvia (LSS)	59	▲
Slovenia	59	▲
Ireland	57	▲
Scotland	54	▲
Hungary	53	○
Singapore	51	○
England	49	○
United States	49	○
<b>International average</b>	<b>47</b>	
Israel	46	○
Canada	45	○
New Zealand	45	○
Iceland	43	○
Cyprus	41	○
Hong Kong	32	▼
Greece	29	▼
Portugal	16	▼
Thailand	13	▼
Iran, Islamic Rep.	9	▼
Kuwait	6	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: T3

## SCORING

### Correct Response

- 05:30 OR 5:30
- The answer expressed informally.  
Example: "half past five"

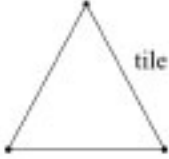
### Incorrect Response

- 04:30, 4:30, or equivalent informal expression.
- 06:00, 6:00, or equivalent informal expression.
- 06:30, 6:30, or equivalent informal expression.
- 08:30, 8:30, or equivalent informal expression.
- Other incorrect.

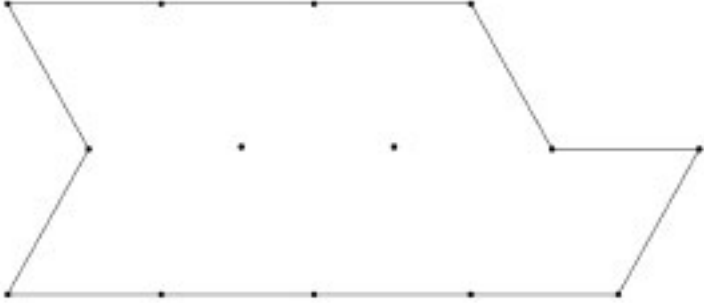
<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Measurement, Estimation, and Number Sense</b>	<b>Solving Problems</b>

Triangles in figure

The triangle represents one tile in the shape of a triangle.



How many tiles will it take to cover the figure below?



Number of tiles: \_\_\_\_\_

Use the figure above to show how you worked out your answer.

**Overall Percent Correct**

Japan	77	▲
Netherlands	76	▲
Korea	74	▲
Austria	73	▲
Hungary	69	▲
Singapore	66	▲
Hong Kong	63	▲
Czech Republic	60	▲
Slovenia	53	○
Norway	52	○
Scotland	52	○
<b>International average</b>	<b>50</b>	
Australia	49	○
Canada	49	○
Iceland	46	○
Israel	46	○
United States	46	○
Cyprus	44	○
Portugal	43	▼
Greece	41	▼
Iran, Islamic Rep.	41	▼
Latvia (LSS)	40	▼
England	38	▼
New Zealand	37	▼
Ireland	36	▼
Thailand	22	▼
Kuwait	15	▼

<b>Country average vs. International average:</b>	
Higher	▲
Not different	○
Lower	▼

Item Number: U1

**SCORING**

**Correct Response**

- 14. Figure is correctly partitioned.

**Partial Response**

- 14. Partition includes errors.
- 14. Partition is not shown.
- The figure is correctly partitioned. Triangles are miscounted. (Count does not equal 14.)

**Incorrect Response**

- Neither partition nor number of triangles is correct.
- Other incorrect.

Content Domain	Cognitive Domain
Measurement, Estimation, and Number Sense	Knowing

Millimeters in a meter

How many millimeters are in a meter?

Answer: \_\_\_\_\_

### Overall Percent Correct

Czech Republic	72	▲
Hong Kong	72	▲
Slovenia	70	▲
Austria	67	▲
Hungary	67	▲
Latvia (LSS)	65	▲
Japan	62	▲
Australia	57	▲
Netherlands	57	○
Portugal	54	○
Greece	53	○
Korea	52	○
<b>International average</b>	<b>49</b>	
Ireland	46	○
England	44	○
New Zealand	43	○
Norway	43	○
Singapore	43	○
Canada	41	○
Cyprus	41	▼
Israel	41	○
Iran, Islamic Rep.	38	▼
Scotland	37	▼
Thailand	34	▼
Iceland	29	▼
United States	21	▼
Kuwait	17	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: V5

### SCORING

#### Correct Response

- 1,000
- Thousand or "one thousand."

#### Incorrect Response

- 10
- 60
- 100
- 10,000
- Other incorrect

<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Data Representation, Analysis and Probability</b>	Using Complex Procedures

What % of time in play and homework

The figure shows how Mary spent her time one day.

What percent of time altogether did she spend playing and doing homework?

A. 10%

B. 15%

C. 20%

D. 25%

E. 30%

**Overall Percent Correct**

Korea	96	▲
Singapore	90	▲
Austria	88	▲
Netherlands	88	▲
Hong Kong	86	▲
Ireland	84	▲
Slovenia	82	○
Australia	81	▲
Norway	80	○
Czech Republic	78	○
United States	78	○
Canada	75	○
England	75	○
Iceland	75	○
<b>International average</b>	<b>75</b>	
Scotland	74	○
Thailand	74	○
Hungary	73	○
New Zealand	73	○
Latvia (LSS)	70	○
Portugal	70	○
Israel	68	○
Greece	65	○
Cyprus	63	▼
Kuwait	43	▼
Iran, Islamic Rep.	40	▼

<b>Country average vs. International average:</b>	
Higher	▲
Not different	○
Lower	▼

Item Number: J3

<b>Correct Response:</b>	<b>D</b>
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Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Using Complex Procedures

Who won and by how many points

Kyle and Bob are playing a game. The object of the game is to get the highest total of points. This chart shows how many points they each scored.

Scorecard

Player	Kyle	Bob
Round 1	125	100
Round 2	125	125
Round 3	150	100
Round 4	50	150

Who won, and by how many points?

- A. Bob won by 25 points.
- B. Bob won by 100 points.
- C. Kyle won by 25 points.
- D. Kyle won by 175 points.

### Overall Percent Correct

Singapore	71	▲
Czech Republic	70	▲
Netherlands	70	▲
Ireland	69	▲
Austria	66	▲
Japan	65	▲
Slovenia	63	▲
Hong Kong	62	▲
Israel	57	○
Australia	55	○
Korea	53	○
Scotland	53	○
United States	53	○
<b>International average</b>	<b>50</b>	
New Zealand	49	○
Canada	47	○
England	45	○
Latvia (LSS)	43	○
Greece	39	○
Norway	38	▼
Hungary	37	▼
Iceland	36	○
Portugal	34	▼
Thailand	28	▼
Cyprus	25	▼
Kuwait	10	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

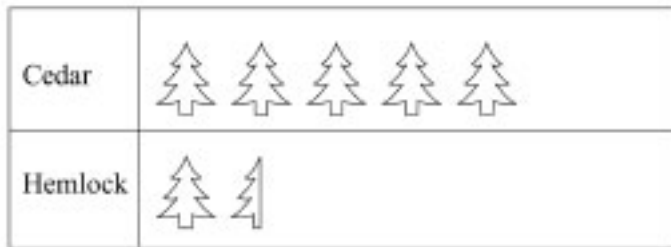
Item Number: K4


Correct Response:	A
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<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Data Representation, Analysis and Probability</b>	Knowing

Pictograph of trees

The graph shows 500 cedar trees and 150 hemlock trees.



How many trees does each  represent?

Answer: \_\_\_\_\_

**Overall Percent Correct**

Japan	90	▲
Hong Kong	83	▲
Singapore	75	▲
United States	68	▲
Korea	63	▲
Netherlands	63	▲
Ireland	62	▲
Scotland	56	○
Iceland	54	○
Australia	51	○
Czech Republic	51	○
Israel	51	○
Cyprus	50	○
<b>International average</b>	<b>49</b>	
Canada	49	○
England	49	○
Thailand	48	○
Austria	45	○
New Zealand	45	○
Hungary	44	○
Slovenia	44	○
Norway	40	○
Latvia (LSS)	31	▼
Greece	25	▼
Portugal	22	▼
Iran, Islamic Rep.	16	▼
Kuwait	7	▼

**Country average vs. International average:**

- Higher ▲
- Not different ○
- Lower ▼

Item Number: L1

**SCORING**

**Correct Response**

- 100.

**Incorrect Response**


- One of the following: 1, 5, 6, 6 1/2, 7, or 650.
- Other incorrect.




<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Data Representation, Analysis and Probability</b>	<b>Solving Problems</b>

Chance of picking red marble


There is only one red marble in each of these bags.



10 Marbles



100 Marbles



1,000 Marbles

Without looking in the bags, you are to pick a marble out of one of the bags. Which bag would give you the greatest chance of picking the red marble?

- The bag with 10 marbles.
- The bag with 100 marbles.
- The bag with 1,000 marbles.
- All bags would give the same chance.

**Overall Percent Correct**

Netherlands	74	▲
Japan	70	▲
Hong Kong	69	▲
United States	68	▲
Canada	63	▲
Hungary	61	▲
Singapore	61	▲
Australia	59	▲
Norway	58	○
Czech Republic	56	○
England	55	○
New Zealand	55	○
Scotland	55	○
Austria	54	○
Ireland	52	○
Israel	51	○
<b>International average</b>		<b>51</b>
Slovenia	49	○
Iceland	47	○
Latvia (LSS)	42	○
Korea	39	▼
Thailand	39	▼
Cyprus	32	▼
Kuwait	31	▼
Greece	30	▼
Portugal	30	▼
Iran, Islamic Rep.	17	▼

<b>Country average vs. International average:</b>	
Higher	▲
Not different	○
Lower	▼





Item Number: L2

<b>Correct Response:</b>	<b>A</b>
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<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Data Representation, Analysis and Probability</b>	Using Complex Procedures

Chance of hitting shaded region

Samantha drops a stone onto each of these targets. The stone has the best chance of landing on a shaded space in which target?

A.  B.  C.  D. 

Overall Percent Correct		
Japan	89	▲
Netherlands	86	▲
Norway	86	▲
Israel	85	○
Greece	84	○
Hong Kong	84	▲
Korea	84	○
Slovenia	84	○
Canada	83	○
United States	83	▲
Czech Republic	82	○
Austria	81	○
Australia	80	○
Latvia (LSS)	79	○
England	78	○
Thailand	78	○
<b>International average</b>	<b>78</b>	
Hungary	76	○
Iceland	76	○
New Zealand	74	○
Scotland	73	○
Ireland	72	○
Iran, Islamic Rep.	70	○
Singapore	70	▼
Cyprus	68	▼
Portugal	62	▼
Kuwait	58	▼

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

Item Number: M1

<b>Correct Response:</b>	<b>B</b>
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Content Domain	Cognitive Domain
Data Representation, Analysis and Probability	Using Complex Procedures

How many raffle tickets

A team is selling raffle tickets. The table shows how many tickets they have sold so far.

Player's Name	Number of Tickets Sold
Carlos	4
Maria	7
Bill	3
Ted	7
Faye	6
Abby	9

They need to sell 60 tickets altogether. How many more tickets must they sell?

Answer: \_\_\_\_\_

### Overall Percent Correct

Korea	83	▲
Austria	75	▲
Singapore	73	▲
Czech Republic	71	▲
Hungary	71	▲
Netherlands	69	▲
Japan	68	▲
Ireland	65	▲
Slovenia	65	▲
Latvia (LSS)	59	○
Hong Kong	57	○
Australia	56	○
Israel	56	○
<b>International average</b>	<b>55</b>	
Canada	54	○
Scotland	54	○
United States	53	○
Greece	51	○
Cyprus	50	○
England	49	○
Norway	48	○
Portugal	47	○
Iceland	45	▼
Thailand	44	▼
New Zealand	38	▼
Iran, Islamic Rep.	23	▼
Kuwait	8	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: M2

### SCORING

#### Correct Response

- 24

#### Incorrect Response

- 30
- 34
- 36
- Other incorrect.

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

Bar graphs of boys and girls

This table shows the ages of the girls and boys in a club.

Age	Number of Girls	Number of Boys
8	4	6
9	8	4
10	6	10

Use the information in the table to complete the graph for ages 9 and 10.

Overall Percent Correct

Korea	83	▲
Japan	78	▲
Hong Kong	75	▲
Singapore	74	▲
United States	55	▲
Australia	50	▲
England	49	▲
New Zealand	48	○
Canada	46	○
Scotland	45	○
Netherlands	42	○
<b>International average</b>	<b>41</b>	
Austria	39	○
Thailand	38	○
Israel	37	○
Iceland	36	○
Ireland	34	▼
Czech Republic	33	▼
Slovenia	32	▼
Hungary	31	▼
Latvia (LSS)	31	▼
Cyprus	30	▼
Greece	28	▼
Norway	26	▼
Portugal	13	▼
Kuwait	8	▼
Iran, Islamic Rep.	1	▼

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

Item Number: S1

SCORING

Correct Response

- All 4 bars correct for height, placement, and shading.
- All 4 bars of correct height; either bars misplaced or bars shaded incorrectly in no more than one set (i.e., for age 9 or age 10).

Partially Correct

- Placement, shading, and height all correct for one, two, or three bars. (At least one bar completely correct).
- All 4 bars of correct height, but two or more errors involving placement or shading.

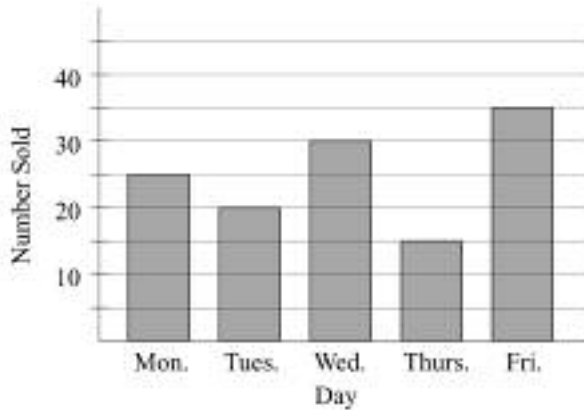
Incorrect Response

- Work is shown, but no bars are drawn. For example: only numbers are shown on the graph.
- Other incorrect.

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

Bar graph: cartons sold Monday

The graph shows the number of cartons of milk sold each day of a week at a school.



How many cartons of milk did the school sell on Monday?

Answer: \_\_\_\_\_

How many cartons of milk did the school sell that week?  
Show your work.

Answer: \_\_\_\_\_

**Overall Percent Correct**

Korea	96	▲
Singapore	95	▲
Japan	94	▲
Netherlands	94	▲
Canada	93	▲
United States	90	▲
Australia	87	▲
Ireland	87	▲
Czech Republic	85	▲
Scotland	83	▲
Thailand	82	▲
Cyprus	79	○
Norway	79	○
Austria	78	○
Iceland	77	○
New Zealand	77	○
Israel	76	○
<b>International average</b>	<b>75</b>	
Hong Kong	74	○
Slovenia	73	○
Hungary	70	○
Latvia (LSS)	63	▼
Greece	62	▼
Portugal	57	▼
Kuwait	17	▼
Iran, Islamic Rep.	12	▼

**Country average vs. International average:**

Higher	▲
Not different	○
Lower	▼

Item Number: T1A

**SCORING**

**Scoring for Part a**

**Correct Response**

- 25

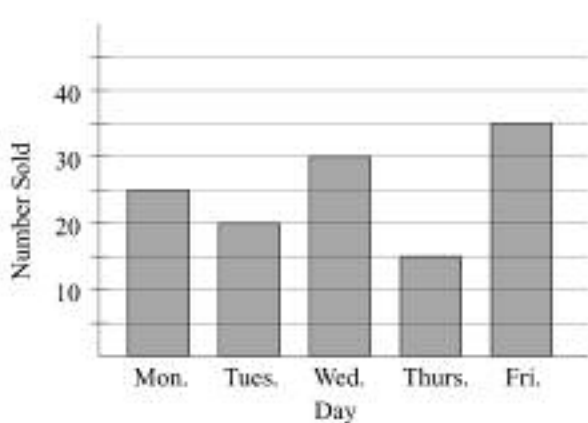
**Incorrect Response**

- 5
- Other incorrect.

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

Bar graph: cartons sold for week

The graph shows the number of cartons of milk sold each day of a week at a school.



How many cartons of milk did the school sell on Monday?

Answer: \_\_\_\_\_

How many cartons of milk did the school sell that week?  
Show your work.

Answer: \_\_\_\_\_

**Overall Percent Correct**

Singapore	80	▲
Korea	73	▲
United States	57	▲
Netherlands	56	▲
Czech Republic	51	▲
Ireland	48	▲
Slovenia	48	▲
Canada	46	▲
Scotland	43	○
Israel	40	○
Austria	38	○
Hong Kong	38	○
<b>International average</b>	<b>37</b>	
Australia	34	○
Greece	33	○
Latvia (LSS)	33	○
Japan	32	○
New Zealand	30	○
Hungary	28	▼
Norway	28	▼
Portugal	26	▼
Thailand	23	▼
Iceland	20	▼
Cyprus	18	▼
Iran, Islamic Rep.	4	▼
Kuwait	3	▼

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

Item Number: T1B

**SCORING**

**Scoring for Part b**

**Correct Response**

- 125. Calculation is shown.
- 125. Verbal explanation of correct procedure.
- Other correct.

**Partially Correct**

- The addition task is shown, but a calculation error was made and answer is incorrect but is other than 115 or 135.
- 125. No work shown.
- Other partial.

**Incorrect Response**

- 115 OR 135. Note: If correct addition task is shown, score as partially correct.
- 25
- Other incorrect.

Content Domain	Cognitive Domain
Geometry	Using Complex Procedures

Map of city blocks

This map shows city blocks with a delivery truck at one corner.

The driver of the delivery truck starts at corner X. He goes 3 blocks east and 2 blocks north to get to the school. On what corner is the school located?

A. A  
 B. B  
 C. C  
 D. D  
 E. E

Overall Percent Correct

Japan	77	▲
Austria	70	▲
Czech Republic	68	▲
Korea	68	▲
Hong Kong	66	▲
England	64	▲
Latvia (LSS)	63	○
Netherlands	63	○
Slovenia	63	▲
United States	62	▲
Scotland	61	○
Norway	60	○
Australia	59	○
Canada	59	○
Hungary	59	○
Ireland	54	○
Israel	54	○
<b>International average</b>	<b>54</b>	
New Zealand	52	○
Iceland	48	○
Singapore	48	○
Cyprus	41	▼
Greece	36	▼
Portugal	34	▼
Kuwait	24	▼
Thailand	24	▼
Iran, Islamic Rep.	18	▼

<b>Country average vs. International average:</b>	
Higher	▲
Not different	○
Lower	▼






Item Number: 11

Correct Response:	<b>B</b>
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Content Domain	Cognitive Domain
Geometry	Knowing

Which figure made with straight sides

Which of these is made with straight sides only?

A.  B.  C.  D.  E. 

**Overall Percent Correct**

Japan	90	▲
Hong Kong	89	▲
Latvia (LSS)	88	▲
Netherlands	88	▲
Australia	86	▲
Slovenia	85	▲
Hungary	84	▲
Czech Republic	83	▲
Korea	83	▲
England	82	▲
Canada	81	▲
New Zealand	81	▲
Norway	81	▲
United States	75	○
Austria	74	○
Singapore	74	○
Scotland	73	○
<b>International average</b>	<b>72</b>	
Israel	72	○
Thailand	72	○
Ireland	71	○
Iceland	70	○
Cyprus	46	▼
Greece	41	▼
Portugal	41	▼
Kuwait	37	▼
Iran, Islamic Rep.	27	▼

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

Item Number: 16

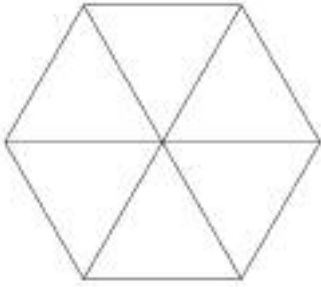
Correct Response:	D
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Content Domain	Cognitive Domain
Geometry	Knowing

Shapes in hexagon

Here is a hexagon.



The hexagon is divided into six

- A. triangles
- B. squares
- C. pentagons
- D. rectangles

Overall Percent Correct

Czech Republic	97	▲
Hong Kong	97	▲
Scotland	95	▲
Slovenia	95	▲
Australia	94	▲
Netherlands	94	▲
Canada	93	▲
New Zealand	93	○
Singapore	92	▲
England	91	○
Iceland	91	○
United States	91	○
Greece	90	○
Israel	90	○
Japan	90	○
Austria	89	○
Latvia (LSS)	89	○
<b>International average</b>	<b>88</b>	
Cyprus	88	○
Ireland	87	○
Portugal	84	○
Hungary	82	▼
Korea	81	▼
Norway	78	▼
Iran, Islamic Rep.	75	▼
Kuwait	75	▼
Thailand	71	▼

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

Item Number: J1

Correct Response:	A
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Content Domain	Cognitive Domain
Geometry	Knowing

Which does not show symmetry

Which of these does NOT show a line of symmetry?

**Overall Percent Correct**

Singapore	93	▲
Scotland	90	▲
Hong Kong	89	▲
Korea	87	▲
England	84	▲
Australia	76	▲
Austria	74	▲
Czech Republic	74	▲
United States	74	▲
Canada	72	▲
Hungary	70	○
Israel	68	○
Iran, Islamic Rep.	66	○
Thailand	66	○
Cyprus	65	○
<b>International average</b>	<b>64</b>	
Slovenia	63	○
Ireland	62	○
Latvia (LSS)	62	○
New Zealand	58	○
Iceland	52	▼
Japan	52	▼
Greece	41	▼
Netherlands	40	▼
Portugal	37	▼
Norway	29	▼
Kuwait	21	▼

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

Item Number: J2

Correct Response:	C
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Content Domain	Cognitive Domain
Geometry	Knowing

Which number in square but not in triangle

Here is a figure.

Which number is in the square and the circle but is NOT in the triangle?

A. 2  
B. 3  
C. 4  
D. 5

**Overall Percent Correct**

Czech Republic	87	▲
Hungary	83	▲
Canada	78	▲
Australia	76	▲
England	74	▲
United States	74	▲
Slovenia	72	○
Hong Kong	70	○
Netherlands	70	○
New Zealand	70	○
Ireland	69	○
Scotland	69	○
Austria	68	○
Israel	66	○
<b>International average</b>	<b>65</b>	
Singapore	64	○
Cyprus	60	○
Iceland	59	○
Iran, Islamic Rep.	59	○
Norway	59	○
Portugal	58	○
Japan	56	▼
Latvia (LSS)	56	○
Greece	54	○
Thailand	50	▼
Kuwait	49	▼
Korea	38	▼

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

Item Number: K1


<b>Correct Response:</b>	<b>A</b>
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Content Domain	Cognitive Domain
Geometry	Knowing


Rectangle divided into four parts

Which rectangle is NOT divided into 4 equal parts?


**A.**




**B.**



**C.**



**D.**



Item Number: K8

**Overall Percent Correct**

Korea	90	▲
Netherlands	89	▲
Japan	86	▲
Singapore	85	▲
Australia	84	▲
Austria	83	▲
Ireland	83	▲
United States	83	▲
Czech Republic	82	▲
Canada	78	○
Hong Kong	78	○
Hungary	78	○
Slovenia	78	○
Scotland	77	○
England	75	○
Iceland	75	○
Latvia (LSS)	75	○
<b>International average 73</b>		
Israel	72	○
Thailand	71	○
New Zealand	69	○
Cyprus	66	○
Norway	63	▼
Greece	52	▼
Portugal	49	▼
Iran, Islamic Rep.	38	▼
Kuwait	35	▼

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


<b>Correct Response:</b>	<b>D</b>
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<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Geometry</b>	Knowing


Objects on game board grid


This is a game board.

Which object is located at (2, D)?

A. The plane 

B. The truck 

C. The bus 

D. The boat 

Item Number: L3

**Overall Percent Correct**

Netherlands	97	▲
United States	97	▲
Czech Republic	96	▲
Scotland	95	▲
Australia	94	▲
England	94	▲
Canada	93	○
Hong Kong	93	▲
Iceland	93	○
New Zealand	93	▲
Slovenia	93	○
Ireland	92	○
Singapore	92	▲
Korea	91	○
Austria	90	○
Hungary	88	○
Norway	88	○
<b>International average</b>		<b>88</b>
Greece	86	○
Latvia (LSS)	85	○
Cyprus	83	○
Israel	80	○
Thailand	80	○
Iran, Islamic Rep.	70	▼
Portugal	69	▼
Kuwait	61	▼

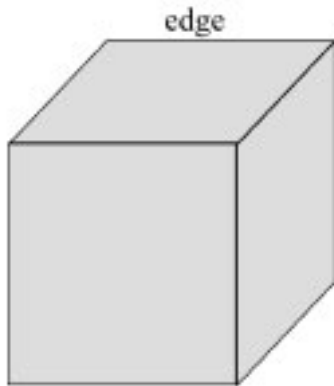
<b>Country average vs. International average:</b>	
Higher	▲
Not different	○
Lower	▼

**Correct Response: A**

Content Domain	Cognitive Domain
Geometry	Knowing

Edges of cube

This picture shows a cube with one edge marked. How many edges does the cube have altogether?



- A. 6
- B. 8
- C. 12
- D. 24

**Overall Percent Correct**

Hong Kong	72	▲
Portugal	62	▲
Slovenia	60	▲
Canada	59	▲
Japan	59	▲
Netherlands	55	▲
Australia	54	▲
Austria	50	○
Czech Republic	47	○
Scotland	44	○
Singapore	44	○
Ireland	43	○
Hungary	42	○
<b>International average</b>	<b>40</b>	
England	39	○
United States	35	○
Greece	33	○
Israel	32	○
Latvia (LSS)	32	○
New Zealand	32	○
Thailand	32	○
Korea	31	▼
Cyprus	25	▼
Iceland	25	▼
Iran, Islamic Rep.	17	▼
Kuwait	17	▼
Norway	8	▼

**Country average vs. International average:**

- Higher ▲
- Not different ○
- Lower ▼

Item Number: L5

Correct Response:	C
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<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Geometry</b>	<b>Solving Problems</b>

Coordinates of dot on grid

On this grid, find the dot with the circle around it. We can describe where this dot is by saying it is at First Number 1, Second Number 3

Now find the dot with the triangle around it. Describe where the dot is on the grid in the same way. Fill in the numbers we would use:

First Number \_\_\_\_\_ Second Number \_\_\_\_\_

**Overall Percent Correct**

England	68	▲
Japan	61	▲
Australia	56	▲
Singapore	56	▲
United States	56	▲
Scotland	55	▲
Korea	52	▲
Canada	51	○
Netherlands	50	○
Israel	49	○
Iceland	47	○
Slovenia	46	○
Ireland	45	○
New Zealand	45	○
Hong Kong	43	○
Latvia (LSS)	42	○
<b>International average</b>	<b>42</b>	
Norway	41	○
Austria	37	○
Czech Republic	37	○
Greece	30	▼
Hungary	30	▼
Cyprus	22	▼
Thailand	19	▼
Portugal	17	▼
Iran, Islamic Rep.	14	▼
Kuwait	14	▼

<b>Country average vs. International average:</b>	
Higher	▲
Not different	○
Lower	▼

Item Number: M4

**SCORING**

**Correct Response**

- 3 and 2, in this order.

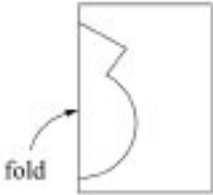
**Incorrect Response**

- 2 and 3, in this order.
- Other incorrect.

Content Domain	Cognitive Domain
Geometry	Knowing

Cut-out shape

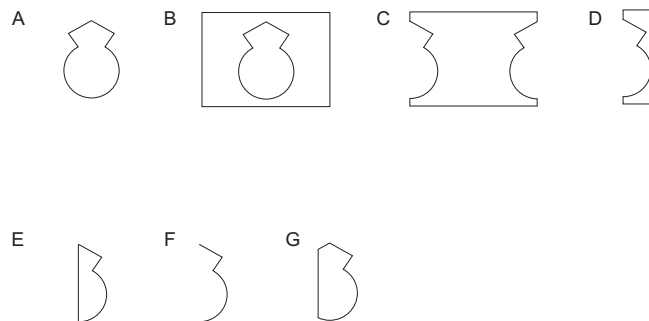
Craig folded a piece of paper in half and cut out a shape.



Draw a picture to show what the cut-out shape will look like when it is opened up and flattened out.

Item Number: T5

SCORING



Note: See the examples above. The accuracy in drawing is not important, nor is the size of the figure.

Correct Response

- The drawing of the cut-out shape corresponds to figure A.
- The drawing of the remaining piece of paper corresponds to figure B.
- Other correct.

Incorrect Response

- Drawing corresponds to figure C.
- Drawing corresponds to figure D.
- Drawings correspond to figures E or F or G.
- Other incorrect.

Overall Percent Correct

Japan	88	▲
Singapore	87	▲
Korea	84	▲
Hong Kong	81	▲
England	76	▲
Scotland	76	▲
Australia	72	▲
Netherlands	71	▲
Canada	68	▲
Slovenia	68	▲
Austria	66	▲
United States	66	▲
New Zealand	64	○
Czech Republic	63	○
Hungary	62	○
Latvia (LSS)	60	○
<b>International average</b>	<b>59</b>	
Iceland	57	○
Ireland	57	○
Israel	55	○
Thailand	46	▼
Norway	43	▼
Cyprus	35	▼
Greece	28	▼
Portugal	26	▼
Iran, Islamic Rep.	15	▼
Kuwait	7	▼

Country average vs. International average:

- Higher ▲
- Not different ○
- Lower ▼



Content Domain	Cognitive Domain
Patterns, Relations, and Functions	Solving Problems

Number sentence for pages

Tanya has read the first 78 pages in a book that is 130 pages long. Which number sentence could Tanya use to find the number of pages she must read to finish the book?

A.  $130 + 78 = \square$

B.  $\square - 78 = 130$

C.  $130 \div 78 = \square$

D.  $130 - 78 = \square$

### Overall Percent Correct

Japan	88	▲
Korea	86	▲
Austria	83	▲
Czech Republic	78	▲
Hungary	78	▲
Hong Kong	75	▲
Netherlands	75	▲
Singapore	74	▲
Latvia (LSS)	72	▲
United States	71	▲
Slovenia	67	○
Canada	63	○
<b>International average</b>	<b>62</b>	
Israel	61	○
Ireland	60	○
Australia	59	○
Cyprus	57	○
Thailand	54	○
Greece	50	▼
Iceland	49	▼
Norway	49	▼
New Zealand	48	▼
Iran, Islamic Rep.	47	▼
Portugal	47	▼
Scotland	47	▼
England	43	▼
Kuwait	25	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: 17

Correct Response:	D
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Content Domain	Cognitive Domain
Patterns, Relations, and Functions	Solving Problems

Operation to get B from A

What do you have to do to each number in Column A to get the number next to it in Column B?

Column A	Column B
10	2
15	3
25	5
50	10

- A. Add 8 to the number in Column A.
- B. Subtract 8 from the number in Column A.
- C. Multiply the number in Column A by 5.
- D. Divide the number in Column A by 5.

### Overall Percent Correct

Korea	70	▲
Czech Republic	57	▲
Hungary	56	▲
Singapore	54	▲
Latvia (LSS)	53	▲
Japan	50	▲
Slovenia	47	○
Israel	45	○
Austria	41	○
Netherlands	41	○
<b>International average</b>	<b>39</b>	
Canada	38	○
Ireland	38	○
Australia	37	○
Thailand	37	○
England	35	○
Portugal	32	○
United States	32	○
Scotland	31	○
Norway	30	○
Cyprus	29	▼
Iran, Islamic Rep.	29	▼
New Zealand	27	▼
Greece	24	▼
Iceland	24	▼
Kuwait	20	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: J5

**Correct Response: D**

Content Domain	Cognitive Domain
Patterns, Relations, and Functions	Knowing

Multiply by five

Which pair of numbers follows the rule “Multiply the first number by 5 to get the second number”?

A.  $15 \rightarrow 3$

B.  $6 \rightarrow 11$

C.  $11 \rightarrow 6$

D.  $3 \rightarrow 15$

### Overall Percent Correct

Korea	80	▲
Japan	73	▲
Hong Kong	71	▲
Hungary	68	▲
Singapore	66	▲
United States	65	▲
Ireland	62	▲
Slovenia	61	○
Israel	59	○
Czech Republic	56	○
Australia	54	○
Latvia (LSS)	53	○
<b>International average</b>	<b>53</b>	
Canada	50	○
Iceland	50	○
Scotland	49	○
Cyprus	48	○
Austria	47	○
Norway	46	○
Thailand	44	○
England	42	▼
New Zealand	42	○
Greece	41	▼
Portugal	40	▼
Iran, Islamic Rep.	38	▼
Netherlands	36	▼
Kuwait	31	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: K3

Correct Response:	D
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<b>Content Domain</b>	<b>Cognitive Domain</b>
<b>Patterns, Relations, and Functions</b>	Solving Problems

How many tiles in next figure

Here is the beginning of a pattern of tiles.




Figure 1

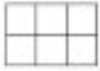


Figure 2

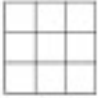


Figure 3

If the pattern continues, how many tiles will be in Figure 6?

A. 12

B. 15

C. 18

D. 21

**Overall Percent Correct**

Korea	87	▲
Japan	86	▲
Netherlands	83	▲
Hong Kong	76	▲
Singapore	75	▲
Czech Republic	72	▲
Latvia (LSS)	72	○
Slovenia	72	▲
Austria	68	○
Ireland	68	○
Australia	65	○
Hungary	65	○
<b>International average</b>	<b>63</b>	
Scotland	61	○
Canada	60	○
Thailand	59	○
United States	59	○
Cyprus	56	○
Israel	56	○
Portugal	56	○
England	54	▼
Iceland	52	○
Greece	50	○
New Zealand	49	▼
Norway	49	▼
Kuwait	41	▼
Iran, Islamic Rep.	39	▼

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

Item Number: K6

<b>Correct Response:</b>	<b>C</b>
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Content Domain	Cognitive Domain
Patterns, Relations, and Functions	Knowing

Shapes in a pattern

These shapes are arranged in a pattern.

○△○○△△○○○△△△

Which set of shapes is arranged in the same pattern?

A. ★□★□★★□□★★□□

B. □★□□★□□□★□□□□

C. ★□★★ □□★★★□□□

D. □□★★□★□□★★□★

Overall Percent Correct

Korea	93	▲
Japan	91	▲
Austria	85	▲
Singapore	85	▲
Netherlands	84	▲
Hong Kong	82	▲
Latvia (LSS)	82	▲
Czech Republic	80	▲
Hungary	80	▲
United States	79	▲
Australia	78	○
Canada	78	○
England	75	○
Ireland	75	○
Slovenia	75	○
Scotland	73	○
<b>International average</b>	<b>72</b>	
New Zealand	71	○
Israel	69	○
Iceland	67	○
Norway	65	○
Portugal	58	▼
Thailand	55	▼
Iran, Islamic Rep.	54	▼
Cyprus	52	▼
Greece	51	▼
Kuwait	44	▼

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

Item Number: L4

Correct Response:	C
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Content Domain	Cognitive Domain
Patterns, Relations, and Functions	Knowing

True statement of ages

Henry is older than Bill, and Bill is older than Peter. Which statement must be true?

A. Henry is older than Peter.

B. Henry is younger than Peter.

C. Henry is the same age as Peter.

D. We cannot tell who is oldest from the information.

**Overall Percent Correct**

Korea	86	▲
Hong Kong	74	▲
Japan	73	▲
United States	73	▲
Singapore	72	▲
Slovenia	72	○
Australia	70	▲
Canada	68	○
Israel	68	○
England	66	○
Ireland	66	○
Netherlands	66	○
Norway	66	○
Scotland	65	○
Hungary	64	○
New Zealand	64	○
<b>International average</b>	<b>63</b>	
Czech Republic	62	○
Iceland	61	○
Austria	57	○
Cyprus	56	○
Greece	54	○
Portugal	54	▼
Latvia (LSS)	50	▼
Thailand	47	▼
Kuwait	43	▼
Iran, Islamic Rep.	41	▼

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

Item Number: L9

<b>Correct Response:</b>	<b>A</b>
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Content Domain	Cognitive Domain
Patterns, Relations, and Functions	Performing Routine Procedures

Make number sentence true

Here is a number sentence.

$$4 \times \square < 17$$

Which number could go in the  $\square$  to make the sentence true?

A. 4

B. 5

C. 12

D. 13

### Overall Percent Correct

Korea	93	▲
Japan	89	▲
Singapore	87	▲
Slovenia	86	▲
Hong Kong	83	▲
Hungary	79	▲
Latvia (LSS)	79	○
Israel	77	○
Austria	74	○
Czech Republic	72	○
United States	71	○
Netherlands	70	○
<b>International average</b>	<b>70</b>	
Canada	69	○
Cyprus	67	○
Iceland	67	○
Greece	66	○
Australia	65	○
Ireland	65	○
Portugal	65	○
Norway	63	○
Iran, Islamic Rep.	62	○
Scotland	59	▼
New Zealand	57	▼
England	56	▼
Thailand	56	▼
Kuwait	43	▼

### Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: M9

Correct Response:	A
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Content Domain	Cognitive Domain
Patterns, Relations, and Functions	Knowing

## Next number in pattern

These numbers are part of a pattern.

50 , 46 , 42 , 38 , 34 , ...

What do you have to do to get the next number?

Answer: \_\_\_\_\_

## Overall Percent Correct

Hungary	79	▲
Singapore	79	▲
Netherlands	77	▲
Ireland	74	▲
Korea	74	▲
Australia	72	▲
Latvia (LSS)	70	▲
Slovenia	68	▲
Cyprus	67	▲
Czech Republic	65	▲
Hong Kong	65	▲
Austria	64	○
Scotland	63	○
United States	61	○
Japan	58	○
Canada	57	○
England	57	○
<b>International average</b>	<b>57</b>	
New Zealand	48	▼
Israel	46	▼
Norway	46	▼
Greece	42	▼
Portugal	30	▼
Iceland	27	▼
Iran, Islamic Rep.	22	▼
Kuwait	12	▼

## Country average vs. International average:

Higher	▲
Not different	○
Lower	▼

Item Number: U4

## SCORING

## Correct Response

- "The number decreases by 4".
- 30 OR 30,26,22,. . .
- Other correct.

## Incorrect Response

- Indicates an increase by 4.
- Focuses on the number 4. No indication of increase or decrease.
- Other incorrect, includes decreases by 4 that are wrong numbers in the pattern.