

RELEASED

MATHEMATICS ITEMS

This book contains the released Trends in International Mathematics and Science Study (TIMSS) 1999 grade 8 mathematics assessment items. This is not a complete set of all TIMSS 1999 assessment items because some items are kept confidential so that they may be used in subsequent cycles of TIMSS to measure trends.

How Can This Set of Released Items Be Used?

In teacher-designed assessments. The items in this book present different ways of measuring students' understanding in various content and cognitive domains. A teacher may use these items to create an assessment according to the needs of the class after reviewing the items and selecting items of interest.

For feedback on student understanding. Student responses can be scored according to the scoring information provided in the book. Items that coincide with concepts taught in class allow the teacher to gain feedback on the students' understanding of assessed concepts. For example, a teacher might decide to examine the incorrect or partially correct responses of the class. The teacher might use the items to identify particular difficulties or misconceptions experienced by individual students, which can serve as the basis for some remedial teaching or focused practice.

To benchmark student performance. The teacher might also compare the percent of students in the class who responded correctly to an item with the percent of students who responded correctly to the same item in other education systems or in the United States.

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Guide to the Content and Layout of This Book

This book contains the released items from TIMSS 1999. 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

1999 Cognitive Domains:

- Knowing
- Using routine procedures
- Investigating and problem solving
- Mathematical reasoning
- Communicating

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*.

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.
- **Scoring guide.** This form is used to assist in scoring write-in 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 some extended response items.

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

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Italy | 74 | ▲ |
| Moldova | 73 | ○ |
| Canada | 73 | ▲ |
| Hungary | 73 | ○ |
| Romania | 72 | ○ |
| Australia | 72 | ○ |
| Netherlands | 71 | ○ |
| Latvia (LSS) | 70 | ○ |
| England | 70 | ○ |
| International Average | 69 | |
| Tunisia | 69 | ○ |
| New Zealand | 69 | ○ |
| Bulgaria | 68 | ○ |
| United States | 68 | ○ |
| Turkey | 66 | ○ |
| Israel | 66 | ○ |
| Iran, Islamic Rep. | 66 | ○ |
| Finland | 65 | ▼ |
| Japan | 63 | ▼ |
| Chile | 62 | ▼ |
| Jordan | 56 | ▼ |
| Indonesia | 56 | ▼ |
| Lithuania | 54 | ▼ |
| Morocco | 53 | ▼ |
| Philippines | 42 | ▼ |
| South Africa | 37 | ▼ |

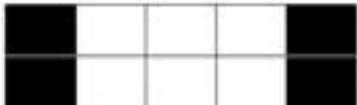
| Country average vs. International average: | |
|--|---|
| Higher | ▲ |
| Not different | ○ |
| Lower | ▼ |

| | |
|--------------------------|----------|
| 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 | ○ |
| Russian Federation | 62 | ○ |
| Thailand | 61 | ○ |
| England | 60 | ○ |
| Italy | 60 | ○ |
| Israel | 59 | ○ |
| Philippines | 58 | ○ |
| International Average | 58 | |
| New Zealand | 58 | ○ |
| Iran, Islamic Rep. | 56 | ○ |
| Moldova | 54 | ○ |
| Hungary | 53 | ▼ |
| Bulgaria | 52 | ○ |
| 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 | ○ |
| 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 | ○ |
| United States | 51 | ○ |
| Latvia (LSS) | 49 | ○ |
| Bulgaria | 46 | ○ |
| International Average | 46 | |
| England | 45 | ○ |
| Thailand | 45 | ○ |
| New Zealand | 43 | ○ |
| 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 | ○ |
| 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. $\frac{1}{6}$

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

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

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

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 | ○ |
| Czech Republic | 65 | ○ |
| Malaysia | 65 | ○ |
| International Average | 62 | |
| Tunisia | 61 | ○ |
| Latvia (LSS) | 61 | ○ |
| Russian Federation | 59 | ○ |
| Bulgaria | 59 | ○ |
| 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 | ○ |
| 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 | ○ |
| International Average 68 | | |
| Czech Republic | 65 | ○ |
| Israel | 64 | ○ |
| Thailand | 64 | ○ |
| Bulgaria | 63 | ○ |
| 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 | ○ |
| 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 | ○ |
| Slovenia | 41 | ▲ |
| Netherlands | 40 | ○ |
| Hungary | 40 | ▲ |
| Lithuania | 34 | ○ |
| International Average 33 | | |
| Romania | 33 | ○ |
| Canada | 32 | ○ |
| Czech Republic | 32 | ○ |
| Turkey | 30 | ○ |
| Finland | 30 | ○ |
| Australia | 29 | ○ |
| Latvia (LSS) | 29 | ○ |
| Moldova | 29 | ○ |
| 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 | ○ |
| 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 | ○ |
| New Zealand | 68 | ○ |
| Bulgaria | 67 | ○ |
| Latvia (LSS) | 66 | ○ |
| International Average | 63 | |
| Italy | 59 | ○ |
| 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 | ○ |
| 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 | ○ |
| Bulgaria | 53 | ○ |
| Czech Republic | 51 | ○ |
| Malaysia | 50 | ○ |
| Cyprus | 50 | ○ |
| International Average | 50 | |
| Korea, Rep. of | 50 | ○ |
| Russian Federation | 50 | ○ |
| Slovak Republic | 49 | ○ |
| Italy | 48 | ○ |
| Latvia (LSS) | 44 | ○ |
| 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:

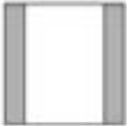
| | |
|---------------|---|
| Higher | ▲ |
| Not different | ○ |
| Lower | ▼ |

| | |
|--------------------------|----------|
| 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 | ○ |
| Slovak Republic | 72 | ○ |
| Thailand | 71 | ○ |
| International Average | 68 | |
| Latvia (LSS) | 66 | ○ |
| Czech Republic | 65 | ○ |
| Italy | 63 | ○ |
| Russian Federation | 61 | ○ |
| 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 | ○ |
| 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 | ○ |
| Russian Federation | 83 | ○ |
| Israel | 83 | ○ |
| International Average | 80 | |
| Macedonia, Rep. of | 79 | ○ |
| Italy | 77 | ○ |
| Thailand | 77 | ○ |
| 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 | ○ |
| Lower | ▼ |

| | |
|-------------------|----------|
| Correct Response: | B |
|-------------------|----------|

| Content Domain | Cognitive Domain |
|----------------------------|--------------------------|
| Fractions and Number Sense | Using Routine Procedures |

Division of fractions

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

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

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Malaysia | 54 | ▲ |
| International Average | 45 | |
| Turkey | 41 | ○ |
| Thailand | 40 | ○ |
| 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 | ○ |
| 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 | ○ |
| Singapore | 45 | ○ |
| Netherlands | 44 | ○ |
| Romania | 40 | ○ |
| International Average | 39 | |
| United States | 39 | ○ |
| Canada | 39 | ○ |
| Malaysia | 39 | ○ |
| Macedonia, Rep. of | 38 | ○ |
| Italy | 36 | ○ |
| 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 | ○ |
| 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.

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

Correct Response: D

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 | ○ |
| Canada | 65 | ▲ |
| Hungary | 65 | ○ |
| Moldova | 64 | ○ |
| Bulgaria | 64 | ○ |
| Australia | 64 | ○ |
| Italy | 63 | ○ |
| England | 62 | ○ |
| Finland | 61 | ○ |
| Cyprus | 61 | ○ |
| Slovak Republic | 61 | ○ |
| Korea, Rep. of | 60 | ○ |
| New Zealand | 58 | ○ |
| International Average | 57 | |
| Thailand | 56 | ○ |
| Tunisia | 54 | ○ |
| Romania | 51 | ○ |
| 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 | ○ |
| Lower | ▼ |

| 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 | ○ |
| Canada | 79 | ○ |
| New Zealand | 78 | ○ |
| England | 76 | ○ |
| Romania | 76 | ○ |
| Moldova | 75 | ○ |
| International Average | 75 | |
| Thailand | 73 | ○ |
| Italy | 73 | ○ |
| United States | 72 | ○ |
| Cyprus | 71 | ○ |
| Tunisia | 70 | ○ |
| Macedonia, Rep. of | 69 | ○ |
| 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 | ○ |
| 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 | ○ |
| Turkey | 72 | ▲ |
| Singapore | 72 | ○ |
| Chinese Taipei | 72 | ▲ |
| Bulgaria | 71 | ○ |
| Romania | 71 | ○ |
| Finland | 70 | ○ |
| Hong Kong, SAR | 68 | ○ |
| Australia | 67 | ○ |
| Italy | 66 | ○ |
| International Average | 65 | |
| Israel | 62 | ○ |
| Japan | 62 | ○ |
| Slovenia | 61 | ○ |
| Chile | 60 | ○ |
| Malaysia | 56 | ▼ |
| Latvia (LSS) | 55 | ○ |
| 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 | ○ |
| Lower | ▼ |

| | |
|-------------------|----------|
| Correct Response: | B |
|-------------------|----------|

| Content Domain | Cognitive Domain |
|----------------------------|--------------------------|
| Fractions and Number Sense | Using Routine Procedures |

Subtraction with three fractions

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

- A. $\frac{1}{5}$
- B. $\frac{2}{5}$
- C. $\frac{7}{15}$
- D. $\frac{3}{4}$
- E. $\frac{4}{5}$

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 | ○ |
| Hungary | 60 | ○ |
| Lithuania | 58 | ○ |
| Canada | 57 | ○ |
| Czech Republic | 55 | ○ |
| Netherlands | 55 | ○ |
| United States | 55 | ○ |
| International Average | 52 | |
| Indonesia | 51 | ○ |
| Finland | 51 | ○ |
| Thailand | 51 | ○ |
| Latvia (LSS) | 50 | ○ |
| Romania | 50 | ○ |
| Bulgaria | 48 | ○ |
| Australia | 48 | ○ |
| Cyprus | 47 | ○ |
| Israel | 44 | ▼ |
| Turkey | 44 | ▼ |
| Moldova | 43 | ○ |
| 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 ○
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 | ○ |
| Japan | 79 | ▲ |
| Lithuania | 76 | ○ |
| International Average | 74 | |
| Romania | 72 | ○ |
| Italy | 72 | ○ |
| Israel | 72 | ○ |
| Thailand | 68 | ○ |
| 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 | ○ |
| 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. $\frac{1}{2}$, $\frac{2}{4}$, $\frac{4}{6}$

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

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

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

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 | ○ |
| Bulgaria | 68 | ○ |
| Malaysia | 68 | ○ |
| Slovak Republic | 67 | ○ |
| Latvia (LSS) | 66 | ○ |
| Lithuania | 66 | ○ |
| Slovenia | 65 | ○ |
| Cyprus | 64 | ○ |
| United States | 63 | ○ |
| Australia | 63 | ○ |
| Finland | 61 | ○ |
| International Average 61 | | |
| Czech Republic | 60 | ○ |
| Israel | 59 | ○ |
| Italy | 57 | ○ |
| Thailand | 57 | ○ |
| Jordan | 55 | ○ |
| Romania | 55 | ○ |
| 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 | ○ |
| 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 | ○ |
| Finland | 53 | ○ |
| Belgium (Flemish) | 52 | ○ |
| New Zealand | 49 | ○ |
| Australia | 48 | ○ |
| Malaysia | 47 | ○ |
| England | 46 | ○ |
| Slovak Republic | 45 | ○ |
| Thailand | 45 | ○ |
| Canada | 45 | ○ |
| Hungary | 45 | ○ |
| Czech Republic | 44 | ○ |
| International Average | 44 | |
| Philippines | 43 | ○ |
| Bulgaria | 43 | ○ |
| Russian Federation | 42 | ○ |
| Israel | 42 | ○ |
| Moldova | 41 | ○ |
| Latvia (LSS) | 41 | ○ |
| United States | 41 | ○ |
| Slovenia | 39 | ○ |
| Romania | 38 | ○ |
| Turkey | 38 | ○ |
| Italy | 38 | ○ |
| Indonesia | 37 | ○ |
| Cyprus | 36 | ○ |
| 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 | ○ |
| 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 | ○ |
| Hungary | 40 | ○ |
| Bulgaria | 39 | ○ |
| Russian Federation | 39 | ○ |
| Lithuania | 39 | ○ |
| Belgium (Flemish) | 39 | ○ |
| Slovak Republic | 39 | ○ |
| Canada | 36 | ○ |
| Slovenia | 36 | ○ |
| International Average | 35 | |
| United States | 35 | ○ |
| Finland | 34 | ○ |
| Cyprus | 33 | ○ |
| Australia | 32 | ○ |
| Latvia (LSS) | 31 | ○ |
| Turkey | 29 | ○ |
| Romania | 29 | ○ |
| Moldova | 29 | ○ |
| New Zealand | 29 | ○ |
| Macedonia, Rep. of | 28 | ○ |
| Italy | 27 | ○ |
| England | 27 | ○ |
| 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:

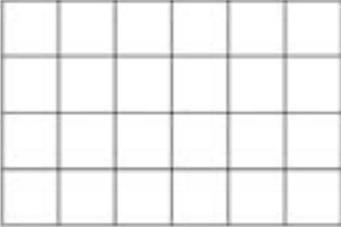
| | |
|---------------|---|
| Higher | ▲ |
| Not different | ○ |
| Lower | ▼ |

| | |
|-------------------|----------|
| Correct Response: | B |
|-------------------|----------|

| Content Domain | Cognitive Domain |
|----------------------------|------------------|
| Fractions and Number Sense | Knowing |

Shade in $\frac{3}{8}$ 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

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Australia | 60 | ▲ |
| Slovenia | 55 | ○ |
| Bulgaria | 54 | ○ |
| Cyprus | 54 | ○ |
| England | 52 | ○ |
| Slovak Republic | 52 | ○ |
| Russian Federation | 52 | ○ |
| United States | 49 | ○ |
| International Average | 49 | |
| Thailand | 49 | ○ |
| New Zealand | 46 | ○ |
| Italy | 46 | ○ |
| Latvia (LSS) | 46 | ○ |
| Moldova | 44 | ○ |
| Czech Republic | 42 | ○ |
| 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 | ○ |
| 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. $60 \times 90 = 5400$
- B. $60 \times 100 = 6000$
- C. $70 \times 90 = 6300$
- D. $70 \times 100 = 7000$

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 | ○ |
| Russian Federation | 65 | ○ |
| International Average | 65 | |
| Israel | 63 | ○ |
| Latvia (LSS) | 62 | ○ |
| Cyprus | 60 | ○ |
| Bulgaria | 60 | ○ |
| Thailand | 58 | ○ |
| Jordan | 58 | ○ |
| Lithuania | 57 | ○ |
| Romania | 55 | ○ |
| 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 | ○ |
| 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 | ○ |
| Finland | 63 | ○ |
| United States | 63 | ▲ |
| Australia | 62 | ○ |
| Lithuania | 62 | ○ |
| Hungary | 61 | ○ |
| Russian Federation | 59 | ○ |
| Thailand | 59 | ○ |

International Average 56

| | | |
|--------------------|----|---|
| Bulgaria | 55 | ○ |
| Italy | 52 | ○ |
| Latvia (LSS) | 52 | ○ |
| Israel | 51 | ○ |
| Turkey | 50 | ○ |
| Cyprus | 50 | ○ |
| New Zealand | 50 | ○ |
| England | 50 | ○ |
| 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 | ○ |
| 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 | ○ |
| Russian Federation | 51 | ○ |
| Australia | 51 | ○ |
| Slovenia | 51 | ○ |
| Latvia (LSS) | 49 | ○ |
| Finland | 48 | ○ |
| Slovak Republic | 48 | ○ |
| Romania | 47 | ○ |
| Lithuania | 46 | ○ |
| International Average | 45 | |
| Moldova | 44 | ○ |
| Czech Republic | 43 | ○ |
| Israel | 43 | ○ |
| New Zealand | 43 | ○ |
| Bulgaria | 43 | ○ |
| England | 42 | ○ |
| Macedonia, Rep. of | 38 | ○ |
| 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 | ○ |
| 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 | ○ |
| Australia | 42 | ○ |
| Slovak Republic | 42 | ○ |
| Russian Federation | 42 | ○ |
| Romania | 41 | ○ |
| Malaysia | 40 | ○ |
| Hungary | 40 | ○ |
| International Average | 36 | |
| Tunisia | 34 | ○ |
| Netherlands | 31 | ○ |
| Czech Republic | 30 | ○ |
| Latvia (LSS) | 28 | ○ |
| 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 | ○ |
| 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 | ○ |
| Chinese Taipei | 84 | ▲ |
| Hong Kong, SAR | 83 | ▲ |
| Thailand | 83 | ▲ |
| Tunisia | 82 | ○ |
| Bulgaria | 81 | ○ |
| Moldova | 80 | ○ |
| Canada | 80 | ○ |
| Latvia (LSS) | 79 | ○ |
| Indonesia | 78 | ○ |
| Romania | 77 | ○ |
| United States | 77 | ○ |
| Italy | 77 | ○ |
| International Average | 77 | |
| Chile | 75 | ○ |
| Australia | 74 | ○ |
| Belgium (Flemish) | 73 | ○ |
| Finland | 72 | ○ |
| Cyprus | 71 | ○ |
| Macedonia, Rep. of | 71 | ○ |
| Iran, Islamic Rep. | 71 | ○ |
| Turkey | 71 | ○ |
| Netherlands | 69 | ○ |
| Philippines | 69 | ▼ |
| Jordan | 65 | ▼ |
| Israel | 63 | ▼ |
| Morocco | 62 | ▼ |
| New Zealand | 61 | ▼ |
| England | 59 | ▼ |
| South Africa | 42 | ▼ |

Country average vs.
International average:

| | |
|---------------|---|
| Higher | ▲ |
| Not different | ○ |
| 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 | ○ |
| Slovenia | 57 | ○ |
| Netherlands | 57 | ○ |
| Bulgaria | 55 | ○ |
| Moldova | 54 | ○ |
| Finland | 54 | ○ |
| International Average | 52 | |
| Romania | 52 | ○ |
| Czech Republic | 50 | ○ |
| Chile | 49 | ○ |
| Canada | 49 | ○ |
| Tunisia | 48 | ○ |
| Turkey | 48 | ○ |
| Latvia (LSS) | 47 | ○ |
| Macedonia, Rep. of | 47 | ○ |
| Australia | 47 | ○ |
| Indonesia | 46 | ○ |
| Italy | 45 | ○ |
| 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 | ○ |
| 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 | ○ |
| United States | 81 | ▲ |
| Lithuania | 80 | ○ |
| Tunisia | 80 | ▲ |
| Russian Federation | 79 | ○ |
| Moldova | 79 | ○ |
| Netherlands | 79 | ○ |
| Australia | 77 | ○ |
| Thailand | 77 | ○ |
| Finland | 76 | ○ |
| Bulgaria | 76 | ○ |
| International Average | 74 | |
| Latvia (LSS) | 74 | ○ |
| Iran, Islamic Rep. | 73 | ○ |
| Cyprus | 70 | ○ |
| Turkey | 69 | ○ |
| Jordan | 69 | ○ |
| Romania | 68 | ○ |
| Israel | 67 | ○ |
| Italy | 67 | ○ |
| 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 | ○ |
| Lower | ▼ |

Correct Response:

B

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

How much money left if spent $\frac{5}{8}$

Laura had \$240. She spent $\frac{5}{8}$ 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 | ○ |
| Australia | 37 | ○ |
| Slovenia | 35 | ○ |
| Slovak Republic | 33 | ○ |
| Cyprus | 33 | ○ |
| Canada | 30 | ○ |
| Czech Republic | 30 | ○ |
| International Average | 30 | |
| Bulgaria | 27 | ○ |
| Russian Federation | 27 | ○ |
| United States | 25 | ▼ |
| Italy | 24 | ○ |
| New Zealand | 24 | ○ |
| England | 24 | ○ |
| Latvia (LSS) | 24 | ○ |
| Israel | 23 | ○ |
| 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 | ○ |
| 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

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Slovak Republic | 54 | ○ |
| Lithuania | 54 | ▲ |
| Netherlands | 53 | ○ |
| Russian Federation | 52 | ○ |
| Bulgaria | 50 | ○ |
| Latvia (LSS) | 48 | ○ |
| Finland | 47 | ○ |
| Canada | 46 | ○ |
| International Average | 44 | |
| Australia | 44 | ○ |
| Romania | 43 | ○ |
| United States | 41 | ○ |
| Cyprus | 40 | ○ |
| Tunisia | 39 | ○ |
| Thailand | 38 | ○ |
| Italy | 36 | ○ |
| 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 ○
- 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

SCORING

A: Scoring for Total Number of Boxes

Correct Response

• 7

Incorrect Response

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

Overall Percent Correct

| | | |
|--------------------|----|---|
| Singapore | 62 | ▲ |
| Chinese Taipei | 60 | ▲ |
| Korea, Rep. of | 59 | ▲ |
| Japan | 58 | ▲ |
| Hong Kong, SAR | 58 | ▲ |
| Belgium (Flemish) | 43 | ▲ |
| Bulgaria | 33 | ○ |
| Malaysia | 33 | ▲ |
| Finland | 32 | ○ |
| Australia | 32 | ▲ |
| Netherlands | 32 | ○ |
| Hungary | 31 | ▲ |
| Canada | 31 | ▲ |
| Slovenia | 31 | ○ |
| Latvia (LSS) | 29 | ○ |
| Russian Federation | 29 | ○ |
| United States | 26 | ○ |

International Average 26

| | | |
|--------------------|----|---|
| Slovak Republic | 25 | ○ |
| England | 24 | ○ |
| Moldova | 24 | ○ |
| New Zealand | 24 | ○ |
| Romania | 22 | ○ |
| Czech Republic | 22 | ○ |
| Lithuania | 22 | ○ |
| 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 | ○ |
| 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: 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 | ○ |
| Malaysia | 16 | ○ |
| Russian Federation | 15 | ○ |
| Canada | 14 | ○ |
| Netherlands | 13 | ○ |
| Hungary | 13 | ○ |
| Australia | 12 | ○ |
| International Average | 12 | |
| Slovenia | 11 | ○ |
| United States | 11 | ○ |
| Slovak Republic | 11 | ○ |
| Romania | 10 | ○ |
| Belgium (Flemish) | 10 | ○ |
| Thailand | 10 | ○ |
| New Zealand | 10 | ○ |
| Moldova | 10 | ○ |
| England | 9 | ○ |
| 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 | ○ |
| 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 | ○ |
| Russian Federation | 59 | ○ |
| Lithuania | 54 | ○ |
| Bulgaria | 54 | ○ |
| New Zealand | 54 | ○ |
| International Average | 54 | |
| England | 53 | ○ |
| Moldova | 49 | ○ |
| Italy | 48 | ○ |
| Israel | 47 | ▼ |
| Romania | 46 | ○ |
| 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 | ○ |
| 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 | ○ |
| Moldova | 43 | ○ |
| Slovenia | 41 | ○ |
| Bulgaria | 40 | ○ |
| Latvia (LSS) | 39 | ○ |
| 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 | ○ |
| 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. $\frac{11}{9}$
- B. $\frac{2}{3}$
- C. $\frac{2}{9}$
- D. $\frac{2}{11}$

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 | ○ |
| Australia | 48 | ○ |
| Italy | 47 | ○ |
| Russian Federation | 46 | ○ |

International Average 45

| | | |
|--------------------|----|---|
| New Zealand | 44 | ○ |
| Thailand | 44 | ○ |
| Indonesia | 43 | ○ |
| England | 42 | ○ |
| Romania | 40 | ○ |
| Bulgaria | 40 | ○ |
| Cyprus | 40 | ○ |
| Israel | 40 | ○ |
| Slovak Republic | 37 | ○ |
| 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 | ○ |
| Lower | ▼ |

Correct Response:

D

| Content Domain | Cognitive Domain |
|----------------|------------------|
| Algebra | Knowing |

Equation representing relationship

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

Overall Percent Correct

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Finland | 68 | ○ |
| Israel | 68 | ○ |
| Thailand | 67 | ○ |
| Romania | 67 | ○ |
| Cyprus | 66 | ○ |
| International Average | 65 | |
| Moldova | 65 | ○ |
| Macedonia, Rep. of | 63 | ○ |
| England | 62 | ○ |
| 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 | ○ |
| 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 | ○ |
| New Zealand | 73 | ○ |
| England | 73 | ○ |
| Thailand | 72 | ○ |
| Netherlands | 70 | ○ |
| Cyprus | 70 | ○ |
| Czech Republic | 70 | ○ |
| International Average 69 | | |
| Slovak Republic | 68 | ○ |
| Bulgaria | 68 | ○ |
| Latvia (LSS) | 66 | ○ |
| Macedonia, Rep. of | 66 | ○ |
| Romania | 64 | ○ |
| 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 | ○ |
| 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 | ○ |
| Australia | 55 | ○ |
| United States | 55 | ▲ |
| Russian Federation | 54 | ○ |
| England | 53 | ○ |
| Indonesia | 53 | ○ |
| New Zealand | 52 | ○ |
| Macedonia, Rep. of | 51 | ○ |
| Philippines | 51 | ○ |
| Czech Republic | 51 | ○ |
| International Average | 50 | |
| Hungary | 48 | ○ |
| Finland | 48 | ○ |
| Slovak Republic | 47 | ○ |
| Cyprus | 46 | ○ |
| Jordan | 46 | ○ |
| Romania | 45 | ○ |
| 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 | ○ |
| Lower | ▼ |

Correct Response:

A

| Content Domain | Cognitive Domain |
|----------------|------------------------------------|
| Algebra | Investigating and Solving Problems |

Find $\frac{1}{3}$ of number from relationship

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

- A. 4
- B. 8
- C. 12
- D. 16

Item Number: F11

Overall Percent Correct

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Cyprus | 49 | ○ |
| International Average | 47 | |
| Latvia (LSS) | 46 | ○ |
| Israel | 44 | ○ |
| Turkey | 44 | ○ |
| New Zealand | 43 | ○ |
| Romania | 41 | ○ |
| Netherlands | 41 | ○ |
| Moldova | 41 | ○ |
| Czech Republic | 40 | ○ |
| 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 | ▼ |

Country average vs. International average:

| | |
|---------------|---|
| Higher | ▲ |
| Not different | ○ |
| 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. $y = \frac{1}{3}(x \pm 1)$

D. $y = 3x + 1$

Item Number: H10

Overall Percent Correct

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Canada | 55 | ▲ |
| Czech Republic | 53 | ○ |
| New Zealand | 52 | ○ |
| Macedonia, Rep. of | 51 | ○ |
| Malaysia | 51 | ○ |
| Jordan | 50 | ○ |
| Latvia (LSS) | 50 | ○ |
| International Average | 49 | |
| Bulgaria | 47 | ○ |
| 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 | ○ |
| Lower | ▼ |

Correct Response:

D

| Content Domain | Cognitive Domain |
|----------------|------------------|
| Algebra | Knowing |

Symbolic linear equation of magazines

\square 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

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Israel | 77 | ▲ |
| Cyprus | 75 | ○ |
| Tunisia | 75 | ○ |
| Bulgaria | 73 | ○ |
| Italy | 72 | ○ |
| International Average | 72 | |
| Romania | 71 | ○ |
| Lithuania | 66 | ○ |
| 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 | ○ |
| 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?

A. 9
B. 10
C. 11
D. 12
E. 13

| x | y |
|-----|-----|
| 2 | 5 |
| 3 | 7 |
| 4 | ? |
| 7 | 15 |

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 | ○ |
| Australia | 70 | ○ |
| Moldova | 69 | ○ |
| Israel | 69 | ○ |
| Slovak Republic | 68 | ○ |
| Thailand | 68 | ○ |
| Belgium (Flemish) | 67 | ○ |
| Finland | 67 | ○ |
| Singapore | 67 | ○ |
| Russian Federation | 66 | ○ |
| Italy | 65 | ○ |
| Tunisia | 65 | ○ |
| Lithuania | 65 | ○ |
| International Average | 65 | |
| Latvia (LSS) | 65 | ○ |
| Bulgaria | 64 | ○ |
| Cyprus | 64 | ○ |
| Romania | 63 | ○ |
| United States | 63 | ○ |
| Czech Republic | 63 | ○ |
| Macedonia, Rep. of | 63 | ○ |
| England | 62 | ○ |
| Jordan | 61 | ○ |
| Malaysia | 58 | ○ |
| 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 | ○ |
| 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 | ○ |
| Hungary | 61 | ▲ |
| Canada | 60 | ▲ |
| Lithuania | 60 | ○ |
| New Zealand | 59 | ○ |
| Russian Federation | 59 | ○ |
| Slovenia | 58 | ○ |
| Netherlands | 58 | ○ |
| England | 57 | ○ |
| Latvia (LSS) | 55 | ○ |
| United States | 55 | ○ |
| International Average | 53 | |
| Cyprus | 52 | ○ |
| Italy | 51 | ○ |
| Moldova | 49 | ○ |
| Macedonia, Rep. of | 45 | ○ |
| 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 | ○ |
| Lower | ▼ |

Correct Response:

C

| Content Domain | Cognitive Domain |
|----------------|-----------------------------|
| Algebra | Communicating and Reasoning |

Correct equation based on x/y table

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

Overall Percent Correct

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Canada | 53 | ○ |
| England | 51 | ○ |
| Czech Republic | 50 | ○ |
| United States | 49 | ○ |
| New Zealand | 49 | ○ |
| Macedonia, Rep. of | 48 | ○ |
| Jordan | 48 | ○ |
| Latvia (LSS) | 45 | ○ |
| International Average | 45 | |
| Bulgaria | 44 | ○ |
| Israel | 41 | ○ |
| Malaysia | 41 | ○ |
| Italy | 39 | ○ |
| Lithuania | 36 | ○ |
| Romania | 35 | ○ |
| 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 | ○ |
| 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 | ○ |
| Canada | 38 | ○ |
| Hungary | 38 | ○ |
| Jordan | 37 | ○ |
| Slovenia | 34 | ○ |
| United States | 34 | ○ |
| Romania | 34 | ○ |
| International Average | 33 | |
| Australia | 33 | ○ |
| Bulgaria | 32 | ○ |
| Thailand | 30 | ○ |
| Indonesia | 29 | ○ |
| Italy | 28 | ○ |
| Czech Republic | 28 | ○ |
| England | 28 | ○ |
| Lithuania | 26 | ○ |
| Moldova | 26 | ○ |
| Cyprus | 26 | ○ |
| 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 | ○ |
| 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 | ○ |
| Cyprus | 51 | ○ |
| Israel | 51 | ○ |
| Italy | 46 | ○ |

International Average 44

| | | |
|--------------------|----|---|
| Malaysia | 43 | ○ |
| 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 | ○ |
| Lower | ▼ |

| Content Domain | Cognitive Domain |
|----------------|--------------------------|
| Algebra | Using Routine Procedures |

Value of expression substituting $x=3$

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

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

| | | |
|--------------------|----|---|
| 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 | ○ |
| United States | 61 | ▲ |
| Australia | 61 | ○ |
| Romania | 59 | ○ |
| Moldova | 57 | ○ |

International Average 53

| | | |
|--------------------|----|---|
| Macedonia, Rep. of | 53 | ○ |
| Israel | 53 | ○ |
| Netherlands | 50 | ○ |
| Malaysia | 48 | ○ |
| Cyprus | 47 | ○ |
| Thailand | 47 | ○ |
| Tunisia | 47 | ▼ |
| Italy | 47 | ○ |
| England | 46 | ○ |
| 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 | ○ |
| Lower | ▼ |

| Content Domain | Cognitive Domain |
|----------------|------------------|
| Algebra | Knowing |

Expression equivalent to $n \times n \times n$

Which of these expressions is equivalent to $n \times n \times n$ for all values of n ?

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

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 | ○ |
| Slovak Republic | 80 | ▲ |
| Indonesia | 80 | ▲ |
| Slovenia | 80 | ▲ |
| Thailand | 80 | ▲ |
| Hungary | 79 | ▲ |
| Latvia (LSS) | 77 | ○ |
| Australia | 77 | ○ |
| Russian Federation | 76 | ○ |
| Canada | 75 | ○ |
| Cyprus | 74 | ○ |
| Malaysia | 74 | ○ |
| Italy | 72 | ○ |
| Lithuania | 71 | ○ |
| International Average | 71 | |
| Iran, Islamic Rep. | 71 | ○ |
| Bulgaria | 69 | ○ |
| Israel | 67 | ○ |
| Chile | 67 | ○ |
| Romania | 66 | ○ |
| New Zealand | 66 | ○ |
| 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 | ○ |
| 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 | ○ |
| Bulgaria | 65 | ○ |
| Romania | 65 | ○ |
| Macedonia, Rep. of | 62 | ○ |
| Japan | 61 | ○ |
| Turkey | 59 | ○ |
| Israel | 58 | ○ |

International Average 57

| | | |
|--------------------|----|---|
| Netherlands | 57 | ○ |
| Italy | 57 | ○ |
| Finland | 57 | ○ |
| Canada | 56 | ○ |
| Moldova | 55 | ○ |
| Australia | 54 | ○ |
| New Zealand | 54 | ○ |
| Tunisia | 53 | ○ |
| Lithuania | 52 | ○ |
| 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 | ○ |
| 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 | ○ |
| Japan | 49 | ▲ |
| Slovak Republic | 48 | ▲ |
| Bulgaria | 47 | ▲ |
| Canada | 43 | ○ |
| Latvia (LSS) | 42 | ○ |
| Romania | 42 | ○ |
| Australia | 41 | ○ |
| Slovenia | 41 | ○ |
| United States | 40 | ○ |
| Netherlands | 40 | ○ |

International Average 37

| | | |
|--------------------|----|---|
| Tunisia | 37 | ○ |
| Moldova | 36 | ○ |
| Israel | 35 | ○ |
| Jordan | 31 | ○ |
| Macedonia, Rep. of | 30 | ○ |
| New Zealand | 30 | ○ |
| England | 30 | ○ |
| Lithuania | 30 | ○ |
| 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 | ○ |
| Lower | ▼ |

Correct Response:

D

| Content Domain | Cognitive Domain |
|----------------|------------------|
| Algebra | Knowing |

Operations on negative number

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

A. k^2

B. k^3

C. $2k$

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

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 | ○ |
| Moldova | 49 | ○ |
| Italy | 49 | ○ |
| Israel | 48 | ○ |

International Average 47

| | | |
|--------------------|----|---|
| United States | 46 | ○ |
| Netherlands | 42 | ○ |
| Malaysia | 42 | ○ |
| Tunisia | 41 | ○ |
| Macedonia, Rep. of | 40 | ○ |
| Canada | 39 | ○ |
| 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 | ○ |
| 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.

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 | ○ |
| Russian Federation | 40 | ○ |
| Netherlands | 38 | ○ |
| Romania | 38 | ○ |
| Australia | 37 | ○ |
| Slovenia | 37 | ○ |
| England | 34 | ○ |
| Cyprus | 34 | ○ |

International Average 33

| | | |
|--------------------|----|---|
| Finland | 32 | ○ |
| Latvia (LSS) | 32 | ○ |
| New Zealand | 32 | ○ |
| Malaysia | 32 | ○ |
| Israel | 30 | ○ |
| 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 | ▼ |

Item Number: T01

SCORING

Correct Response

- 36 boys and 50 girls [Numerical method: e.g., $86 \div 2 = 43$; $43 - 7 = 36$ 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 $86 \div 2 = 43$; $43 - 14 = 29$ 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)

Country average vs. International average:

| | |
|---------------|---|
| Higher | ▲ |
| Not different | ○ |
| 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 | ○ |
| Russian Federation | 67 | ○ |
| Italy | 66 | ○ |
| International Average | 65 | |
| Lithuania | 64 | ○ |
| Cyprus | 64 | ○ |
| Moldova | 64 | ○ |
| Latvia (LSS) | 63 | ○ |
| Israel | 63 | ○ |
| Romania | 57 | ○ |
| 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 ○
- 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

| | | |
|---------------------------------|----|---|
| 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 | ○ |
| International Average 54 | | |
| Bulgaria | 54 | ○ |
| Cyprus | 53 | ○ |
| Moldova | 52 | ○ |
| Italy | 52 | ○ |
| Israel | 52 | ○ |
| Latvia (LSS) | 50 | ○ |
| Lithuania | 47 | ○ |
| 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 ○
- 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

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| England | 35 | ○ |
| United States | 34 | ▲ |
| Czech Republic | 34 | ○ |
| Slovak Republic | 31 | ○ |
| New Zealand | 31 | ○ |
| International Average | 30 | |
| Finland | 30 | ○ |
| Israel | 27 | ○ |
| Russian Federation | 27 | ○ |
| Moldova | 26 | ○ |
| Bulgaria | 26 | ○ |
| Thailand | 25 | ○ |
| 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 | ○ |
| 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

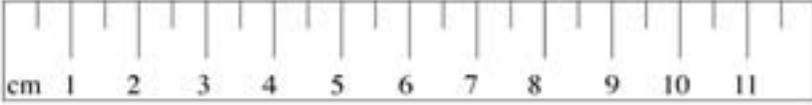
| | | |
|------------------------------|-----------|---|
| Japan | 98 | ▲ |
| Slovak Republic | 96 | ▲ |
| Hungary | 96 | ▲ |
| Czech Republic | 95 | ▲ |
| Korea, Rep. of | 93 | ▲ |
| Bulgaria | 93 | ▲ |
| Slovenia | 93 | ▲ |
| Singapore | 93 | ▲ |
| Belgium (Flemish) | 92 | ▲ |
| Russian Federation | 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 | ○ |
| Moldova | 82 | ○ |
| Hong Kong, SAR | 82 | ○ |
| International Average | 81 | |
| Cyprus | 79 | ○ |
| Turkey | 78 | ○ |
| 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 | ○ |
| 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 | ○ |
| Canada | 52 | ○ |
| England | 51 | ○ |
| International Average 49 | | |
| Israel | 48 | ○ |
| Chinese Taipei | 47 | ○ |
| Romania | 45 | ○ |
| 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 | ○ |
| 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 | ○ |
| Canada | 51 | ○ |
| Belgium (Flemish) | 51 | ▲ |
| Finland | 46 | ○ |
| Hungary | 46 | ○ |
| Slovenia | 46 | ○ |
| Cyprus | 45 | ○ |
| Italy | 45 | ○ |
| Bulgaria | 42 | ○ |
| International Average | 42 | |
| Czech Republic | 40 | ○ |
| England | 40 | ○ |
| New Zealand | 40 | ○ |
| Tunisia | 38 | ○ |
| Russian Federation | 38 | ○ |
| Thailand | 35 | ○ |
| Moldova | 34 | ○ |
| 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 | ○ |
| 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

| | | |
|------------------------------|-----------|---|
| 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 | ○ |
| Korea, Rep. of | 72 | ○ |
| Cyprus | 70 | ○ |
| Romania | 68 | ○ |
| New Zealand | 68 | ○ |
| International Average | 67 | |
| Tunisia | 67 | ○ |
| Israel | 67 | ○ |
| Moldova | 66 | ○ |
| Bulgaria | 65 | ○ |
| Singapore | 62 | ○ |
| 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 | ○ |
| 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 | ○ |
| Thailand | 64 | ○ |
| Malaysia | 63 | ○ |
| Romania | 62 | ○ |
| Iran, Islamic Rep. | 61 | ○ |
| Czech Republic | 61 | ○ |
| Bulgaria | 61 | ○ |
| England | 61 | ○ |
| Slovenia | 61 | ○ |
| International Average | 60 | |
| Macedonia, Rep. of | 60 | ○ |
| Moldova | 58 | ○ |
| Lithuania | 58 | ○ |
| Cyprus | 56 | ○ |
| New Zealand | 56 | ○ |
| Tunisia | 53 | ○ |
| Netherlands | 52 | ○ |
| 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 | ○ |
| 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. $\frac{1}{2}$

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

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

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

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 | ○ |
| Russian Federation | 26 | ○ |
| Bulgaria | 25 | ○ |
| International Average | 22 | |
| Slovak Republic | 21 | ○ |
| Malaysia | 21 | ○ |
| Slovenia | 21 | ○ |
| Moldova | 21 | ○ |
| Jordan | 20 | ○ |
| Czech Republic | 20 | ○ |
| Latvia (LSS) | 20 | ○ |
| Lithuania | 19 | ○ |
| Australia | 18 | ○ |
| Turkey | 18 | ○ |
| South Africa | 18 | ○ |
| Tunisia | 17 | ○ |
| Indonesia | 17 | ○ |
| Cyprus | 17 | ○ |
| Hungary | 16 | ○ |
| New Zealand | 16 | ○ |
| Canada | 16 | ▼ |
| Israel | 15 | ▼ |
| Netherlands | 15 | ○ |
| Iran, Islamic Rep. | 15 | ▼ |
| Chile | 14 | ▼ |
| England | 13 | ▼ |
| Macedonia, Rep. of | 13 | ▼ |
| Morocco | 12 | ▼ |
| United States | 11 | ▼ |
| Finland | 11 | ▼ |
| Thailand | 9 | ▼ |
| Philippines | 8 | ▼ |

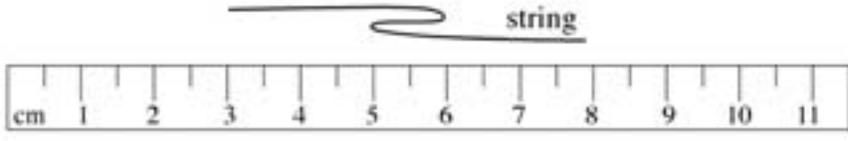
Country average vs. International average:

| | |
|---------------|---|
| Higher | ▲ |
| Not different | ○ |
| 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 | ○ |
| Korea, Rep. of | 50 | ▲ |
| Russian Federation | 48 | ○ |
| Malaysia | 46 | ○ |
| Canada | 46 | ○ |
| New Zealand | 45 | ○ |
| Lithuania | 44 | ○ |
| England | 43 | ○ |
| International Average | 41 | |
| Thailand | 41 | ○ |
| Moldova | 40 | ○ |
| Bulgaria | 39 | ○ |
| United States | 39 | ○ |
| Tunisia | 38 | ○ |
| Cyprus | 36 | ○ |
| Romania | 36 | ○ |
| Israel | 34 | ○ |
| 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 | ○ |
| 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 | ○ |
| Australia | 55 | ▲ |
| Bulgaria | 52 | ○ |
| Slovenia | 49 | ○ |
| Russian Federation | 49 | ○ |
| Italy | 48 | ○ |
| England | 48 | ○ |
| Czech Republic | 46 | ○ |
| Hungary | 45 | ○ |
| Latvia (LSS) | 44 | ○ |
| International Average 43 | | |
| Romania | 43 | ○ |
| New Zealand | 41 | ○ |
| Cyprus | 41 | ○ |
| Moldova | 38 | ○ |
| 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 ○
- 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 | ○ |
| Bulgaria | 64 | ○ |
| Lithuania | 60 | ○ |
| Russian Federation | 60 | ○ |
| International Average | 59 | |
| Italy | 55 | ○ |
| Thailand | 53 | ○ |
| 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 | ○ |
| 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 | ○ |
| Romania | 66 | ○ |
| Italy | 65 | ○ |
| Macedonia, Rep. of | 65 | ○ |
| Belgium (Flemish) | 65 | ○ |
| Netherlands | 64 | ○ |
| Australia | 62 | ○ |
| International Average | 62 | |
| Malaysia | 59 | ○ |
| Israel | 58 | ○ |
| Thailand | 58 | ○ |
| 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 | ○ |
| 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 | ○ |
| Singapore | 61 | ○ |
| Australia | 61 | ○ |
| Romania | 59 | ○ |
| England | 58 | ○ |
| Italy | 56 | ○ |
| Lithuania | 55 | ○ |
| Canada | 55 | ○ |
| Cyprus | 54 | ○ |
| Macedonia, Rep. of | 54 | ○ |
| International Average | 54 | |
| New Zealand | 53 | ○ |
| Hong Kong, SAR | 53 | ○ |
| Moldova | 53 | ○ |
| Malaysia | 52 | ○ |
| Jordan | 50 | ○ |
| United States | 46 | ▼ |
| Iran, Islamic Rep. | 46 | ○ |
| Netherlands | 42 | ○ |
| 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 | ○ |
| Lower | ▼ |

| | |
|-------------------|---|
| Correct Response: | E |
|-------------------|---|

| Content Domain | Cognitive Domain |
|----------------|------------------|
| Geometry | Knowing |

Two similar triangles

Two of the triangles below are similar.

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

Overall Percent Correct

| | | |
|------------------------------|-----------|---|
| Japan | 84 | ▲ |
| Korea, Rep. of | 82 | ▲ |
| Singapore | 76 | ▲ |
| Malaysia | 74 | ▲ |
| Chinese Taipei | 74 | ▲ |
| Bulgaria | 74 | ▲ |
| Russian Federation | 71 | ▲ |
| Slovak Republic | 70 | ○ |
| Lithuania | 69 | ○ |
| Thailand | 69 | ▲ |
| Macedonia, Rep. of | 68 | ○ |
| Moldova | 68 | ○ |
| Latvia (LSS) | 68 | ○ |
| Hungary | 67 | ○ |
| Belgium (Flemish) | 66 | ○ |
| Australia | 66 | ○ |
| Slovenia | 66 | ○ |
| Romania | 66 | ○ |
| Czech Republic | 66 | ○ |
| Canada | 65 | ○ |
| Italy | 65 | ○ |
| Hong Kong, SAR | 65 | ○ |
| Finland | 63 | ○ |
| Netherlands | 62 | ○ |
| United States | 62 | ○ |
| International Average | 62 | |
| Iran, Islamic Rep. | 61 | ○ |
| England | 60 | ○ |
| New Zealand | 57 | ○ |
| Cyprus | 55 | ○ |
| 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 | ○ |
| 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 | ○ |
| Italy | 62 | ○ |
| Czech Republic | 58 | ○ |
| International Average | 58 | |
| Jordan | 57 | ○ |
| Iran, Islamic Rep. | 55 | ○ |
| Bulgaria | 53 | ○ |
| Israel | 51 | ○ |
| 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 | ○ |
| 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 | ○ |
| Malaysia | 49 | ▲ |
| Russian Federation | 49 | ○ |
| Slovak Republic | 49 | ○ |
| Romania | 48 | ○ |
| England | 43 | ○ |
| Italy | 41 | ○ |
| Moldova | 40 | ○ |
| Czech Republic | 40 | ○ |
| International Average | 40 | |
| Hungary | 39 | ○ |
| Netherlands | 39 | ○ |
| Latvia (LSS) | 39 | ○ |
| Tunisia | 38 | ○ |
| Australia | 36 | ○ |
| Macedonia, Rep. of | 36 | ○ |
| Canada | 36 | ○ |
| Lithuania | 35 | ○ |
| Jordan | 35 | ○ |
| Israel | 35 | ○ |
| Cyprus | 30 | ○ |
| 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 | ○ |
| 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 .

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 | ○ |
| Canada | 50 | ▲ |
| Australia | 50 | ○ |
| Singapore | 50 | ○ |
| Slovak Republic | 48 | ○ |
| New Zealand | 47 | ○ |
| Slovenia | 46 | ○ |
| Thailand | 46 | ○ |
| Czech Republic | 46 | ○ |
| Tunisia | 44 | ○ |
| International Average | 42 | |
| United States | 42 | ○ |
| Malaysia | 42 | ○ |
| Bulgaria | 40 | ○ |
| Lithuania | 39 | ○ |
| Moldova | 39 | ○ |
| Cyprus | 38 | ○ |
| England | 36 | ○ |
| 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 | ○ |
| 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 | ○ |
| Hungary | 43 | ○ |
| Russian Federation | 41 | ○ |
| Finland | 39 | ○ |
| Australia | 39 | ○ |
| Romania | 38 | ○ |
| Slovak Republic | 38 | ○ |
| International Average | 37 | |
| United States | 36 | ○ |
| Moldova | 36 | ○ |
| Canada | 35 | ○ |
| New Zealand | 34 | ○ |
| Slovenia | 34 | ○ |
| England | 34 | ○ |
| Bulgaria | 33 | ○ |
| Czech Republic | 32 | ○ |
| Malaysia | 32 | ○ |
| Jordan | 32 | ○ |
| Lithuania | 31 | ○ |
| Cyprus | 31 | ○ |
| Latvia (LSS) | 30 | ○ |
| Thailand | 30 | ▼ |
| Italy | 29 | ▼ |
| Israel | 29 | ○ |
| 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 | ○ |
| 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 | ○ |
| New Zealand | 55 | ▲ |
| Canada | 50 | ○ |
| Finland | 49 | ○ |
| Italy | 49 | ○ |
| England | 48 | ○ |
| Latvia (LSS) | 48 | ○ |
| United States | 47 | ○ |
| International Average | 46 | |
| Russian Federation | 44 | ○ |
| Lithuania | 43 | ○ |
| Iran, Islamic Rep. | 42 | ○ |
| Israel | 41 | ○ |
| Thailand | 40 | ○ |
| Cyprus | 37 | ○ |
| 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 | ○ |
| 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.

| Month | Coats | Suits |
|-------|-------|-------|
| Jan | 350 | 0 |
| Feb | 300 | 100 |
| Mar | 250 | 150 |
| Apr | 250 | 200 |
| May | 200 | 400 |
| Jun | 150 | 500 |
| Jul | 100 | 450 |
| Aug | 130 | 150 |
| Sep | 150 | 200 |
| Oct | 50 | 450 |
| Nov | 0 | 350 |
| Dec | 350 | 0 |

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 | ○ |
| Lithuania | 62 | ○ |
| Latvia (LSS) | 62 | ○ |
| Israel | 62 | ○ |
| Italy | 61 | ○ |
| International Average | 60 | |
| Czech Republic | 58 | ○ |
| Bulgaria | 55 | ○ |
| 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 | ○ |
| 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 | ○ |
| United States | 62 | ▲ |
| Cyprus | 60 | ○ |
| Japan | 58 | ○ |
| International Average | 57 | |
| Jordan | 57 | ○ |
| Chile | 56 | ○ |
| Hong Kong, SAR | 55 | ○ |
| Israel | 55 | ○ |
| Romania | 53 | ○ |
| Turkey | 52 | ○ |
| 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 | ○ |
| Lower | ▼ |

Correct Response:

C

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

Bar chart histogram of travel time

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

| Time (in minutes) | Number of Pupils |
|-------------------|------------------|
| 0-5 | 2 |
| 6-10 | 7 |
| 11-15 | 5 |
| 16-20 | 2 |

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 | ○ |
| Hungary | 69 | ○ |
| Slovak Republic | 65 | ○ |
| International Average | 64 | |
| Latvia (LSS) | 61 | ○ |
| Moldova | 60 | ○ |
| Italy | 59 | ○ |
| Israel | 59 | ▼ |
| Russian Federation | 59 | ○ |
| Cyprus | 58 | ▼ |
| Lithuania | 58 | ○ |
| 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 | ○ |
| 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 | ○ |
| Canada | 67 | ○ |
| Russian Federation | 65 | ○ |
| Bulgaria | 65 | ○ |
| Cyprus | 64 | ○ |
| Australia | 64 | ○ |
| Thailand | 64 | ○ |
| International Average 62 | | |
| England | 59 | ○ |
| Tunisia | 59 | ○ |
| United States | 58 | ○ |
| Romania | 56 | ○ |
| Italy | 56 | ○ |
| New Zealand | 56 | ○ |
| Lithuania | 56 | ○ |
| 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 | ○ |
| 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 | ○ |
| Thailand | 77 | ▲ |
| Czech Republic | 76 | ○ |
| Italy | 74 | ○ |
| Russian Federation | 73 | ○ |
| International Average | 69 | |
| Cyprus | 67 | ○ |
| Romania | 63 | ○ |
| Turkey | 62 | ▼ |
| Hungary | 61 | ○ |
| Israel | 61 | ○ |
| 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 | ○ |
| 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 | ○ |
| Bulgaria | 64 | ○ |
| Lithuania | 64 | ○ |
| United States | 63 | ▲ |
| Czech Republic | 63 | ○ |
| Russian Federation | 63 | ○ |
| New Zealand | 62 | ○ |
| Malaysia | 61 | ○ |
| Israel | 60 | ○ |
| Tunisia | 58 | ○ |
| International Average | 58 | |
| Cyprus | 57 | ○ |
| 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:

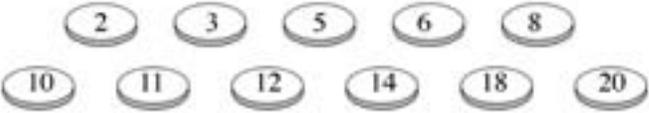
| | |
|---------------|---|
| Higher | ▲ |
| Not different | ○ |
| Lower | ▼ |

| | |
|--------------------------|----------|
| 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.



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. $\frac{1}{11}$

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

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

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

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 | ○ |
| Slovenia | 51 | ○ |
| Cyprus | 51 | ○ |
| Czech Republic | 49 | ○ |
| Israel | 49 | ○ |
| International Average | 48 | |
| Slovak Republic | 48 | ○ |
| Bulgaria | 46 | ○ |
| Turkey | 43 | ○ |
| Malaysia | 42 | ○ |
| 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 | ○ |
| Lower | ▼ |

Correct Response:

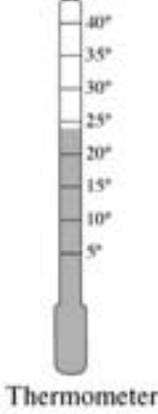
C

| 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 | ○ |
| Malaysia | 85 | ▲ |
| Lithuania | 84 | ○ |
| Latvia (LSS) | 83 | ○ |
| Italy | 81 | ○ |
| International Average | 79 | |
| Israel | 74 | ○ |
| Bulgaria | 72 | ○ |
| 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 | ○ |
| 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 | ○ |
| United States | 59 | ○ |
| Russian Federation | 58 | ○ |
| New Zealand | 58 | ○ |
| Lithuania | 57 | ○ |
| Latvia (LSS) | 55 | ○ |
| Israel | 55 | ○ |
| International Average | 54 | |
| Czech Republic | 53 | ○ |
| Bulgaria | 51 | ○ |
| Italy | 48 | ○ |
| Cyprus | 46 | ○ |
| 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 | ○ |
| 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 | ○ |
| Australia | 29 | ○ |
| Finland | 28 | ○ |
| Italy | 27 | ○ |
| United States | 26 | ○ |
| Netherlands | 25 | ○ |
| Lithuania | 25 | ○ |
| International Average | 24 | |
| Bulgaria | 22 | ○ |
| Thailand | 21 | ○ |
| Cyprus | 21 | ○ |
| Romania | 20 | ○ |
| 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 | ○ |
| Lower | ▼ |

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