TIMSS

IEA's Third International Mathematics and Science Study

TIMSS Mathematics Items:
Released Set for Population 1 (Third and Fourth Grades)

Overview of TIMSS

TIMSS is a collaborative research project sponsored by the International Association for the Evaluation of Educational Achievement (IEA). In 1994-95, achievement tests in mathematics and science were administered to carefully selected samples of students in classrooms around the world. With more than 40 countries participating, five grades assessed in two school subjects, more than half a million students tested in more than 30 languages, and millions of open-ended responses generated, TIMSS is the largest and most ambitious study of comparative educational achievement ever undertaken.

TIMSS tested and collected contextual information about the schooling of students in the following grade levels:

- Students enrolled in the two adjacent grades that contained the largest proportion of 9-year-olds students – grades 3 and 4 in many countries
- Students enrolled in the two adjacent grades that contained the largest proportion of 13-year-old students – grades 7 and 8 in many countries
- Students in their final year of secondary education. As an additional option, countries could test two special subgroups of these students:
  - Students taking advanced courses in mathematics
  - Students taking advanced courses in physics

The three different groups of TIMSS students listed above are often referred to as Populations 1, 2, and 3, respectively. All countries participated in the testing at Population 2 (grades 7 and 8), which is the core of TIMSS. Countries could choose whether or not to participate in the testing at the other two populations. Table 1 lists the 26 participants that satisfied all of the steps necessary to have their Population 1 mathematics results published in the international report.[1] Forty-one countries had achievement results published for Population 2 [2] and about 25 countries participated in the testing at Population 3.

[1] Mullis, I.V.S., Martin, M.O., Beaton, A.E., Gonzalez, E.J., Kelly, D.L., and Smith, T.A. (1997). *Mathematics Achievement in the Primary School Years: IEA's Third International Mathematics and Science Study (TIMSS)*. Chestnut Hill, MA: Boston College.

[2] Beaton, A.E., Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., Kelly, D.L., and Smith, T.A. (1996). *Mathematics Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study (TIMSS)*. Chestnut Hill, MA: Boston College.

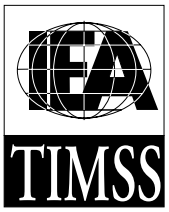
Table 1

TIMSS Participants

Included in the TIMSS International Analyses at Population 1

- Australia
- Austria
- Canada
- Cyprus
- Czech Republic
- England
- Greece
- Hong Kong
- Hungary
- Iceland
- Iran, Islamic Republic
- Ireland
- Israel*
- Japan
- Korea, Republic of
- Kuwait*
- Latvia
- Netherlands
- New Zealand
- Norway
- Portugal
- Scotland
- Singapore
- Slovenia
- Thailand
- United States

* Participated only at the upper grade.



The success of TIMSS depended on a collaborative effort between the research centers in each country responsible for implementing the project, and the network of centers responsible for managing across-country tasks such as training country representatives in standardized procedures, selecting comparable samples of schools and students, and conducting the various steps required for data processing and analysis. The TIMSS International Study Center, responsible for the international coordination of tasks, is housed in the Center for the Study of Testing, Evaluation, and Educational Policy (CSTEEP) at Boston College.

The TIMSS Mathematics Test

The TIMSS curriculum framework underlying the mathematics tests at all three populations was developed by groups of mathematics educators with input from the TIMSS National Research Coordinators (NRCs).[3] The **content** aspect of the framework represents the subject matter content of school mathematics. The **performance expectations** aspect of the framework describes, in a non-hierarchical way, the many kinds of performances or behaviors that might be expected of students in school mathematics. Working within the mathematics curriculum framework, mathematics test specifications were developed for Population 1 that included items representing a wide range of mathematics topics and eliciting a range of skills from the students.

The tests were developed through an international consensus involving input from experts in mathematics and measurement specialists.[4] The TIMSS Subject Matter Advisory Committee, which included distinguished scholars from 10 countries, ensured that the test reflected current thinking and priorities within the field of mathematics. The items underwent an iterative development and review process with several pilot testing efforts. Every effort was made to help ensure that the tests represented the curricula of the participating countries and that the items did not exhibit any bias towards or against particular countries, including modifying specifications in accordance with data from the curriculum analysis component, obtaining ratings of the items by subject matter specialists within the participating countries, and conducting thorough statistical item analysis of data collected in the pilot testing. The final forms of the test were endorsed by the NRCs of all the participating countries. The resulting test for the Population 1 students (third and fourth grades in many countries) contained 102 mathematics items representing a range of mathematics topics and skills.

Approximately one-fourth of the TIMSS items were in the free-response format, which required students to generate and write their own answers. Designed to represent approximately one-third of students' response time, some free-response questions asked for short answers, while others called for extended responses and required students to show their work. The remaining questions used a multiple-choice format. The distribution of items across content areas (as reported in the international reports) and performance expectations, as well as by item format, is presented in Table 2.

[3] The complete TIMSS curriculum frameworks can be found in Robitaille, D.F. et al. (1993). *TIMSS Monograph No. 1: Curriculum Frameworks for Mathematics and Science.* Vancouver, B.C.: Pacific Educational Press.

[4] Please see Garden, R.A. (1996), "Development of the TIMSS Achievement Items" in D.F. Robitaille and R.A. Garden (Eds.), *TIMSS Monograph No. 2: Research Questions and Study Design.* Vancouver, B.C. Pacific Education Press; and Garden, R.A. and Orpwood, G. (1996). "Development of the TIMSS Achievement Test" in M.O. Martin and D.L. Kelly (Eds.), *Third International Mathematics and Science Study Technical Report, Volume I: Design and Development.* Chestnut Hill, MA: Boston College.

Table 2

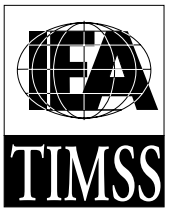
Distribution of Mathematics Items by Content Reporting Category and Performance Expectation[1] - Population 1

Content Category	Number of Items	Number of Multiple-Choice Items	Number of Short-Answer Items	Number of Extended-Response Items
Whole Numbers	25 (16)	19 (10)	5 (5)	1 (1)
Fractions and Proportionality	21 (12)	15 (6)	2 (2)	4 (4)
Measurement, Estimation, and Number Sense	20 (11)	16 (7)	3 (3)	1 (1)
Data Representation, Analysis, and Probability	12 (8)	8 (4)	2 (2)	2 (2)
Geometry	14 (10)	12 (8)	2 (2)	0 (0)
Patterns, Relations, and Functions	10 (8)	9 (7)	1 (1)	0 (0)
Total	102 (65)	79 (42)	15 (15)	8 (8)

Performance Expectation	Number of Items	Number of Multiple-Choice Items	Number of Short-Answer Items	Number of Extended-Response Items
Knowing	42 (22)	35 (15)	7 (7)	0 (0)
Performing Routine Procedures	16 (9)	13 (6)	3 (3)	0 (0)
Using Complex Procedures	24 (15)	21 (12)	2 (2)	1 (1)
Solving Problems[2]	20 (19)	10 (9)	3 (3)	7 (7)

[1] Figure in parentheses refers to the number of items in the released item set and provided in this volume.
[2] Includes one extended-response item classified as "Justifying and Proving" and three extended-response items and one short-answer item classified as "Communicating."

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.



To ensure broad subject matter coverage without overburdening individual students, TIMSS used a rotated design that included both the mathematics and science items. In accordance with the design, the mathematics and science items were assembled in 26 different clusters — labeled A through Z. The clusters were assigned to eight different booklets in accordance with the rotated design so that representative samples of students responded to each cluster.[5] Each Population 1 student completed one test booklet containing both mathematics and science items. Population 1 students were given about an hour of testing time (37 minutes before a short break and 27 minutes after the break).

Item Release Policy

In accordance with IEA policy, TIMSS has kept about one-third of the TIMSS items secure for possible future use in measuring international trends in mathematics and science achievement. For Population 1, the secure items are in clusters labeled A through H. All remaining items (in clusters I through Z) are available for general use. To facilitate this use, the released TIMSS items for Population 1 (third and fourth grades) have been replicated in their entirety in this mathematics volume and in the companion science volume. As shown in Table 2, this volume contains 65 mathematics items, including all of the free-response questions. To provide a unique identifier for each item, the TIMSS cluster and item number is shown in the black box on the right hand side of each page.

While the purpose of this volume is to encourage the use of TIMSS items, please note the IEA copyright. Appropriate references to the IEA and TIMSS should be provided in your use of these items.

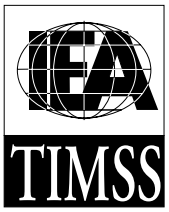
Item Documentation and Item Results

The TIMSS tests were prepared in English and translated into the local languages. Each item is reproduced for this volume exactly as it was presented to each of the TIMSS countries. In translating the tests or making adaptations for cultural purposes, every effort was made to ensure that the meaning and difficulty of items did not change. This process required an enormous effort by the national centers, with many checks made along the way.[6]

Across the bottom of each item, there is documentation about the item, including the subject assessed and the classification of the item by content category and performance expectation. If the item is a two-part item, the documentation for Part A is shown on the first page and the documentation for Part B is shown on the following page.

[5] The TIMSS test design is fully documented in Adams, R. and Gonzalez, E. (1996). "Design of the TIMSS Achievement Instruments" in D.F. Robitaille and R.A. Garden (Eds.), *TIMSS Monograph No. 2: Research Questions and Study Design*. Vancouver, B.C.: Pacific Education Press; and Adams, R. and Gonzalez, E. (1996). "TIMSS Test Design" in M.O. Martin and D.L. Kelly (Eds.), *Third International Mathematics and Science Study Technical Report, Volume I: Design and Development*. Chestnut Hill, MA: Boston College.

[6] More details about the translation verification procedures can be found in Mullis, I.V.S., Kelly, D.L., and Haley, K. (1996). "Translation Verification Procedures" in M.O. Martin and I.V.S. Mullis (Eds.), *Third International Mathematics and Science Study: Quality Assurance in Data Collection*. Chestnut Hill, MA: Boston College; and Maxwell, B. (1996). "Translation and Cultural Adaptation of the TIMSS Instruments" in M.O. Martin and D.L. Kelly (Eds.), *Third International Mathematics and Science Study Technical Report, Volume I*. Chestnut Hill, MA: Boston College.



Subject. All of the items in this volume are mathematics items. The science items are provided in a companion volume, *TIMSS Science Items: Released Set for Population 1 (Third and Fourth Grades).*

Key. For multiple-choice items, the key for the correct answer is provided. For free-response questions, the categories of responses and their codes are shown on the page following the item. In scoring the TIMSS free-response questions, TIMSS utilized two-digit codes with rubrics specific to each item. The first digit designates the correctness level of the response. The first digit is usually a "1" designating a correct response, a "7" indicating an incorrect response, or a "9" for non-response. Sometimes, however, fully correct responses are differentiated from partially correct responses. In these instances, the fully correct responses are designated by a "2" and the partially correct responses by a "1." The second digit, combined with the first digit, represents a diagnostic code used to identify specific types of approaches, strategies, or common errors and misconceptions.

Content Category. The mathematics items were reported according to six content areas.

- Whole Numbers
- Fractions and Proportionality
- Measurement, Estimation, and Number Sense
- Data Representation, Analysis, and Probability
- Geometry
- Patterns, Relations, and Functions

Table 3 indicates which items have been classified into each of the six content areas.

Performance Expectation. Items were classified into the following performance expectations.

- Knowing
- Performing Routine Procedures
- Using Complex Procedures
- Solving Problems

Percent of Students Responding Correctly. The percent of students responding correctly to the item reflects the international average across the countries participating in TIMSS at each grade tested. That is, first the percentage of students responding correctly to the item was calculated for each country. Next, an average was calculated across countries. For the upper grade (fourth grade in many countries), this average was calculated across 26 countries (see Table 1). For the lower grade (third grade in many countries), the average is based on 24 countries. For items using a partial credit scoring scheme, the percentages given are for students responding with fully correct answers.

International Difficulty Index. This statistic reflects the difficulty of the item as estimated from item response theory scaling (IRT). Since the TIMSS scale was developed based on the performance of students at both grades in all countries, the international scale values apply to both grades and to all countries. The higher the index, the more difficult the item.

Table 3

Item Listing by Mathematics Content Area

Whole Numbers	I03	Which number is it?
	I04	What is 3 times 23?
	I09	Subtraction of 4 digit numbers.
	J04	What is the increase in product?
	J09	Number in box.
	K02	Addition of four digit numbers.
	L07	Which pair different by 100?
	M03	Which operation equivalent?
	M06	What to do to correct mistake?
	M08	Choose largest number.
	S02	Complete number sentence.
	T02	Make smallest whole number.
	U05	Addition/multiplication task.
	V02	Number larger than 56821.
	V03	What is 5 less than 203?
	V04A	Game with cards: who won? Explain.
	V04B	Game with cards: winning numbers.
Fractions and Proportionality	I02	0.4 is the same as?
	I05	Sauce from 15 tomatoes.
	I08	Which 2 figures represent same fraction?
	J07	Fraction of figure shaded.
	K09	How many marbles in two bags?
	M05	Decimal representing shaded part of figure.
	S03	Longest box on shelf.
	S04	How many pupils in class?
	T04A	Girl/boy ratio: Is Juanita right?
	T04B	Girl/boy ratio: Is Amanda right?
	U02	Fraction larger than 2/7.
	U03A	Bicycle ride: How long, Maria?
	U03B	Bicycle ride: How long, Louisa?
	U03C	Bicycle ride: Who arrived first?
	V01	Fractions of pie.
Measurement, Estimation, and Number Sense	J06	Choose largest mass.
	J08	Which is best estimate of hours?
	K05	Estimate pencil length.
	K07	Length of rectangle.
	L06	Best estimate of clothespin mass.
	L08	Who had the longest pace?
	M07	Substance measured in milliliters.
	S05	How many paper clip lengths?
	T03	When did Mr. Brown start walk?
	U01	Triangles in figure.
	V05	Millimeters in a meter.
Data Representation, Analysis and Probability	J03	What % of time in play and homework?
	K04	Who won and by how many points?
	L01	Pictograph of trees.
	L02	Chance of picking red marble.
	M01	Chance of hitting shaded region.
	M02	How many raffle tickets?
	S01	Bar graphs of boys and girls.
	T01A	Bar graph: cartons sold Monday.
	T01B	Bar graph: cartons sold for week.
Geometry	I01	Map of city blocks.
	I06	Which figure made with straight sides?
	J01	Shapes in hexagon.
	J02	Which does not show symmetry?
	K01	Which number in square but not in triangle?
	K08	Rectangle divided into four parts.
	L03	Objects on game board grid.
	L05	Edges of cube.
	M04	Coordinates of dot on grid.
	T05	Cut-out shape.
Patterns, Relations, and Functions	I07	Number sentence for pages.
	J05	Operation to get B from A.
	K03	Multiply by five.
	K06	How many tiles in next figure?
	L04	Shapes in a pattern.
	L09	True statement of ages.
	M09	Make number sentence true.
	U04	Next number in pattern.

For More Information About TIMSS

For more details about the TIMSS results and procedures, please see the following reports:

Mathematics Achievement in the Primary School Years: IEA's Third International Mathematics and Science Study. Mullis, I.V.S., Martin, M.O., Beaton, A.E., Gonzalez, E.J., Kelly, D.L., and Smith, T.A. Chestnut Hill, MA: Boston College, 1997.

Science Achievement in the Primary School Years: IEA's Third International Mathematics and Science Study. Martin, M.O., Mullis, I.V.S., Beaton, A.E., Gonzalez, E.J., Smith, T.A., and Kelly, D.L. Chestnut Hill, MA: Boston College, 1997.

Mathematics Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study. Beaton, A.E., Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., Kelly, D.L., and Smith, T.A. Chestnut Hill, MA: Boston College, 1996.

Science Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study. Beaton, A.E., Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Smith, T.A., and Kelly, D.L. Chestnut Hill, MA: Boston College, 1996.

Third International Mathematics and Science Study Technical Report, Volume I: Design and Development. Martin, M.O. and Kelly, D.L., Eds. Chestnut Hill, MA: Boston College, 1996.

Third International Mathematics and Science Study: Quality Assurance in Data Collection. Martin, M.O. and Mullis, I.V.S., Eds. Chestnut Hill, MA: Boston College, 1996.

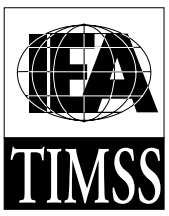
These reports can be ordered from the International Study Center at Boston College.

- To FAX Order: +1(617)552-8419
- To Phone Order: +1(617)552-4521
- To E-mail Order: timss@bc.edu

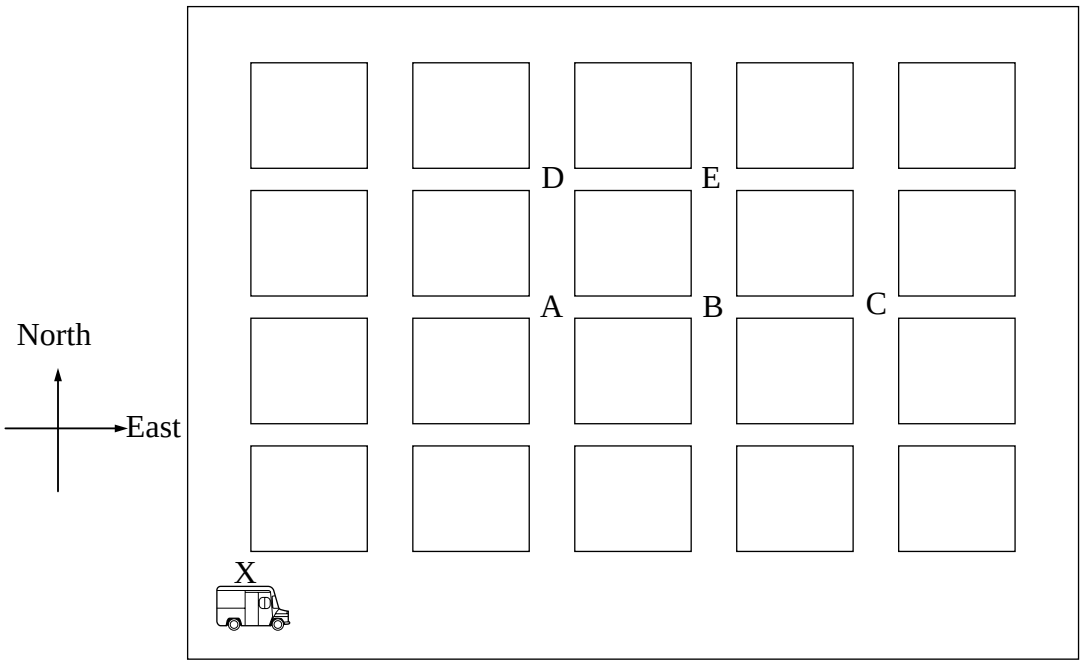
TIMSS reports and this released item set are also available on the World Wide Web:

- http://wwwcsteep.bc.edu/timss

Released Mathematics Items Population 1



I1. This map shows city blocks with a delivery truck at one corner.



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

A. A

B. B

C. C

D. D

E. E

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	B	Geometry	Using Complex Procedures	54%	43%	565

I2. 0.4 is the same as

A. four

B. four tenths

C. four hundredths

D. one-fourth

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	B	Fractions and Proportionality	Knowing	39%	21%	652

I3. When you subtract one of the numbers below from 900, the answer is greater than 300. Which number is it?

A. 823

B. 712

C. 667

D. 579

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Whole Numbers	Using Complex Procedures	57%	46%	547

I4. What is 3 times 23 ?

A. 323

B. 233

C. 69

D. 26

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Whole Numbers	Performing Routine Procedures	84%	74%	400

I5. Mario uses 5 tomatoes to make half a liter of tomato sauce. How much sauce can he make from 15 tomatoes?

A. A liter and a half

B. Two liters

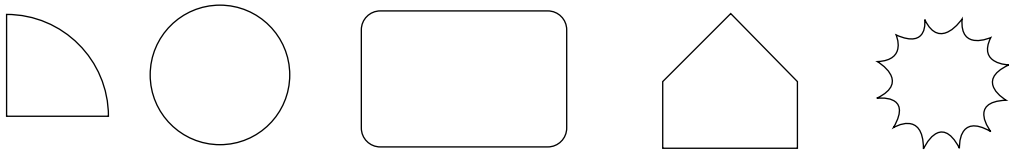
C. Two liters and a half

D. Three liters

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Fractions and Proportionality	Using Complex Procedures	53%	42%	582

I6. Which of these is made with straight sides only?

A. B. C. D. E.



Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Geometry	Knowing	72%	66%	472

I7. Tanya has read the first 78 pages in a book that is 130 pages long. Which number sentence could Tanya use to find the number of pages she must read to finish the book?

A. $130 + 78 = \square$

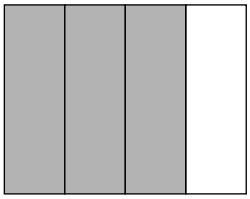
B. $\square - 78 = 130$

C. $130 \div 78 = \square$

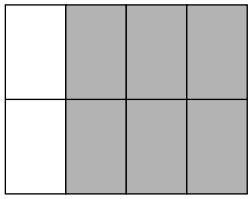
D. $130 - 78 = \square$

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Patterns, Relations, and Functions	Solving Problems	62%	49%	545

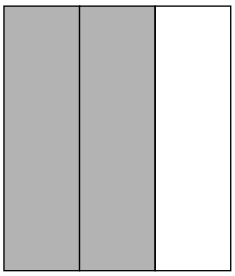
I8. Each figure represents a fraction.



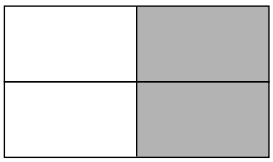
1



2



3



4

Which two figures represent the same fraction?

A. 1 and 2

B. 1 and 4

C. 2 and 3

D. 3 and 4

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Fractions and Proportionality	Using Complex Procedures	54%	46%	568

I9. Subtract: 6000
–2369

A. 4369

B. 3742

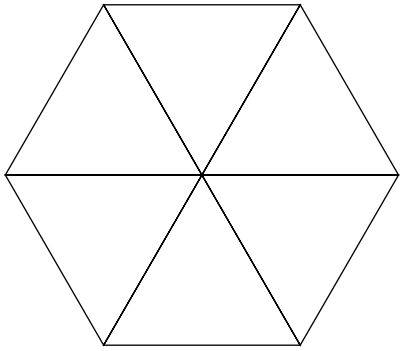
C. 3631

D. 3531

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Whole Numbers	Performing Routine Procedures	71%	50%	513

J-1

J1. Here is a hexagon.



The hexagon is divided into six

A. triangles

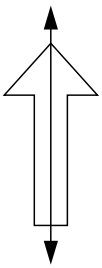
B. squares

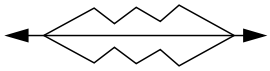
C. pentagons

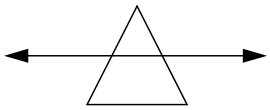
D. rectangles

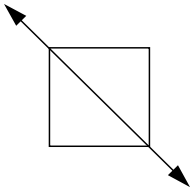
Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Geometry	Knowing	88%	82%	372

J2. Which of these does NOT show a line of symmetry?

A. 

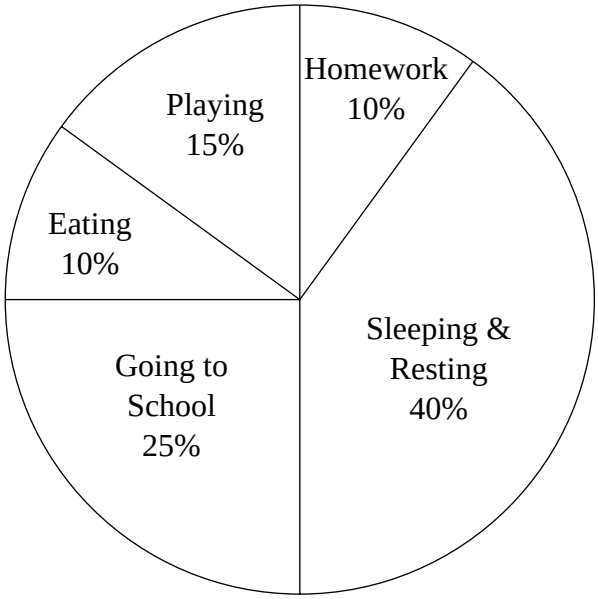
B. 

C. 

D. 

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Geometry	Knowing	64%	54%	515

J3. The figure shows how Mary spent her time one day.



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

A. 10%

B. 15%

C. 20%

D. 25%

E. 30%

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Data Representation, Analysis, and Probability	Using Complex Procedures	75%	62%	472

J4. 25×18 is more than 24×18. How much more?

J-4

A. 1

B. 18

C. 24

D. 25

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	B	Whole Numbers	Using Complex Procedures	45%	30%	614

J5. What do you have to do to each number in Column A to get the number next to it in Column B?

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

A. Add 8 to the number in Column A.

B. Subtract 8 from the number in Column A.

C. Multiply the number in Column A by 5.

D. Divide the number in Column A by 5.

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Patterns, Relations, and Functions	Solving Problems	39%	27%	627

J6. Which of these is largest?

A. 1 kilogram

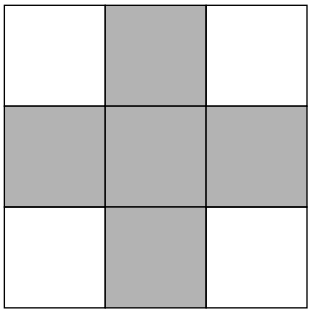
B. 1 centigram

C. 1 milligram

D. 1 gram

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Measurement, Estimation, and Number Sense	Solving Problems	72%	61%	485

J7. Part of the figure is shaded.



What fraction of the figure is shaded?

A. $\frac{5}{4}$

B. $\frac{4}{5}$

C. $\frac{6}{9}$

D. $\frac{5}{9}$

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Fractions and Proportionality	Solving Problems	61%	42%	547

J-8

J8. Elena worked 57 hours in March, 62 hours in April, and 59 hours in May. Which of these is the BEST estimate of the total number of hours she worked for the three months?

A. 50 + 50 + 50

B. 55 + 55 + 55

C. 60 + 60 + 60

D. 65 + 65 + 65

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Measurement, Estimation, and Number Sense	Knowing	52%	33%	591

J9. Here is part of a wall chart that lists numbers from 1 to 100.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25					

Below is part of the same wall chart. What number should be in the box with the question mark inside?

43
53
?

A. 34

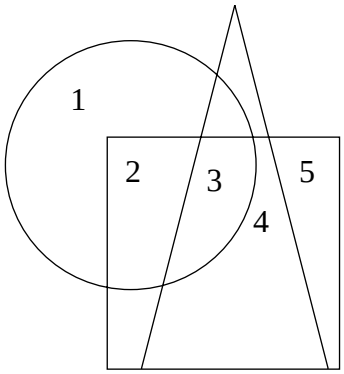
B. 44

C. 54

D. 64

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Whole Numbers	Performing Routine Procedures	73%	64%	460

K1. Here is a figure.



K-1

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

A. 2

B. 3

C. 4

D. 5

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Geometry	Knowing	65%	55%	509

K2. Add: 6971
+5291

A. 11 162

B. 12 162

C. 12 262

D. 1 211 162

K-2

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Whole Numbers	Performing Routine Procedures	84%	67%	429

K3. Which pair of numbers follows the rule “Multiply the first number by 5 to get the second number”?

A. 15 → 3

B. 6 → 11

C. 11 → 6

D. 3 → 15

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Patterns, Relations, and Functions	Knowing	53%	37%	589

K-4

K4. Kyle and Bob are playing a game. The object of the game is to get the highest total of points. This chart shows how many points they each scored.

Scorecard

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

Who won, and by how many points?

A. Bob won by 25 points.

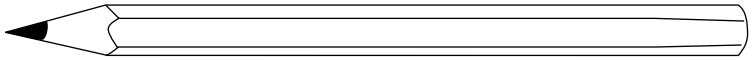
B. Bob won by 100 points.

C. Kyle won by 25 points.

D. Kyle won by 175 points.

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Data Representation, Analysis, and Probability	Using Complex Procedures	50%	34%	595

K5. About how long is this picture of a pencil?



K-5

A. 5 cm

B. 10 cm

C. 20 cm

D. 30 cm

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	B	Measurement, Estimation, and Number Sense	Using Complex Procedures	77%	69%	450

K6. Here is the beginning of a pattern of tiles.

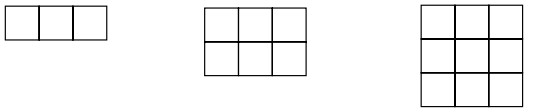


Figure 1 Figure 2 Figure 3

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

A. 12

B. 15

C. 18

D. 21

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Patterns, Relations, and Functions	Solving Problems	63%	52%	530

K7. A thin wire 20 centimeters long is formed into a rectangle. If the width of this rectangle is 4 centimeters, what is its length?

A. 5 centimeters

B. 6 centimeters

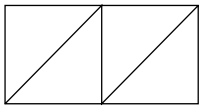
C. 12 centimeters

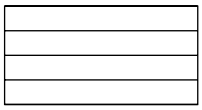
D. 16 centimeters

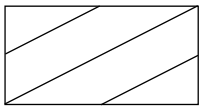
Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	B	Measurement, Estimation, and Number Sense	Performing Routine Procedures	23%	21%	709

K8. Which rectangle is NOT divided into 4 equal parts?

A. 

B. 

C. 

D. 

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Geometry	Knowing	73%	60%	477

K9. There are 54 marbles, and they are put into 6 bags, so that the same number of marbles is in each bag. How many marbles would 2 bags contain?

A. 108 marbles

B. 18 marbles

C. 15 marbles

D. 12 marbles

E. 9 marbles

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	B	Fractions and Proportionality	Using Complex Procedures	37%	27%	638

L1. The graph shows 500 cedar trees and 150 hemlock trees.

Cedar	
Hemlock	

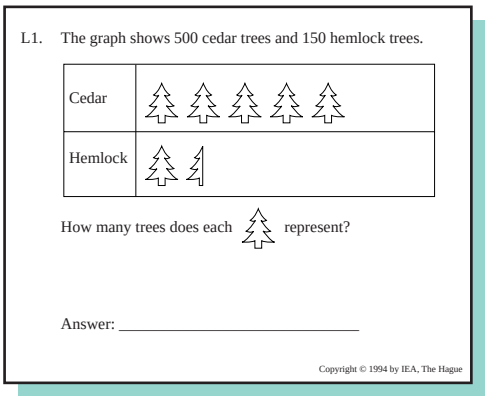
How many trees does each  represent?

Answer: _____

L-1

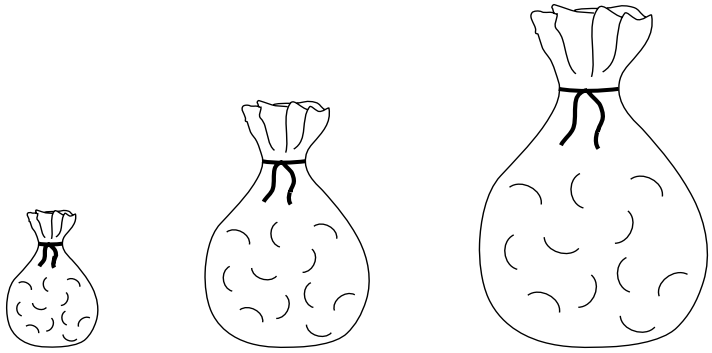
Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Data Representation, Analysis, and Probability	Knowing	49%	34%	601

L-1 Coding Guide



Code	Response
Correct Response	
10	100
Incorrect Response	
70	One of the following: 5, 6, 6 1/2 or 7.
71	1
72	650
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

L2. There is only one red marble in each of these bags.



10 Marbles 100 Marbles 1000 Marbles

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

A. The bag with 10 marbles

B. The bag with 100 marbles

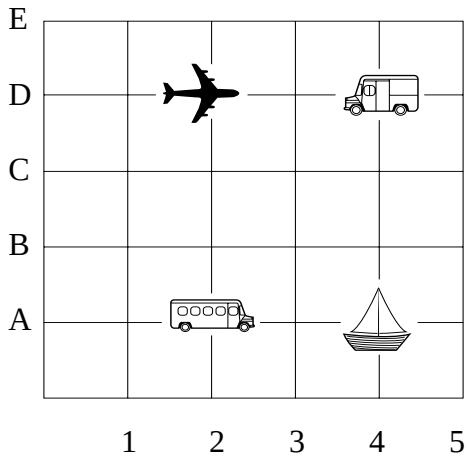
C. The bag with 1000 marbles

D. All bags would give the same chance.

L-2

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Data Representation, Analysis, and Probability	Solving Problems	51%	40%	585

L3. This is a game board.



Which object is located at (2, D)?

A. The plane 

B. The truck 

C. The bus 

D. The boat 

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Geometry	Knowing	88%	80%	383

L4. These shapes are arranged in a pattern.

○△○○△△○○○△△△

Which set of shapes is arranged in the same pattern?

L-4

A. ★□★□★★□□★★□□

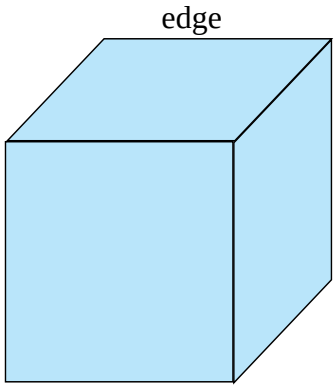
B. □★□□★□□□★□□□□

C. ★□★★ □□★★★□□□

D. □□★★□★□□★★□★

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Patterns, Relations, and Functions	Knowing	72%	61%	488

L5. This picture shows a cube with one edge marked. How many edges does the cube have altogether?



A. 6

B. 8

C. 12

D. 24

L-5

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Geometry	Knowing	40%	34%	619

L6. The weight (mass) of a clothespin is 9.2 g. Which of these is the best estimate of the total weight (mass) of 1000 clothespins?

A. 900 g

B. 9 000 g

C. 90 000 g

D. 900 000 g

L-6

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	B	Measurement, Estimation, and Number Sense	Solving Problems	55%	41%	576

L7. In which pair of numbers is the second number 100 more than the first number?

A. 199 and 209

B. 4236 and 4246

C. 9635 and 9735

D. 51 863 and 52 863

L-7

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Whole Numbers	Using Complex Procedures	49%	33%	607

L8. Four children measured the width of a room by counting how many paces it took them to cross it. The chart shows their measurements.

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

Who had the longest pace?

A. Stephen

B. Erlane

C. Ana

D. Carlos

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Measurement, Estimation, and Number Sense	Solving Problems	32%	21%	673

L9. Henry is older than Bill, and Bill is older than Peter.
Which statement must be true?

A. Henry is older than Peter.

B. Henry is younger than Peter.

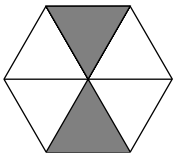
C. Henry is the same age as Peter.

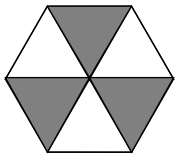
D. We cannot tell who is oldest from the information.

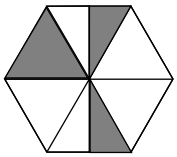
L-9

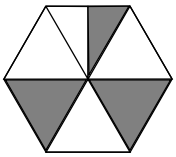
Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Patterns, Relations, and Functions	Knowing	63%	55%	523

M1. Samantha drops a stone onto each of these targets. The stone has the best chance of landing on a shaded space in which target?

A. 

B. 

C. 

D. 

M-1

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	B	Data Representation, Analysis, and Probability	Using Complex Procedures	78%	69%	452

M2. A team is selling raffle tickets. The table shows how many tickets they have sold so far.

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

M-2

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

Answer:_____

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Data Representation, Analysis, and Probability	Using Complex Procedures	55%	39%	575

M-2 Coding Guide

M2. A team is selling raffle tickets. The table shows how many tickets they have sold so far.

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

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

Answer:_____

Code	Response
Correct Response	
10	24
Incorrect Response	
70	30
71	34
72	36
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

M3. ☐ stands for a number. $7 \times$ ☐ will always give the same answer as

A. ☐ $\times 7$

B. ☐ $+ 7$

C. ☐ $- 7$

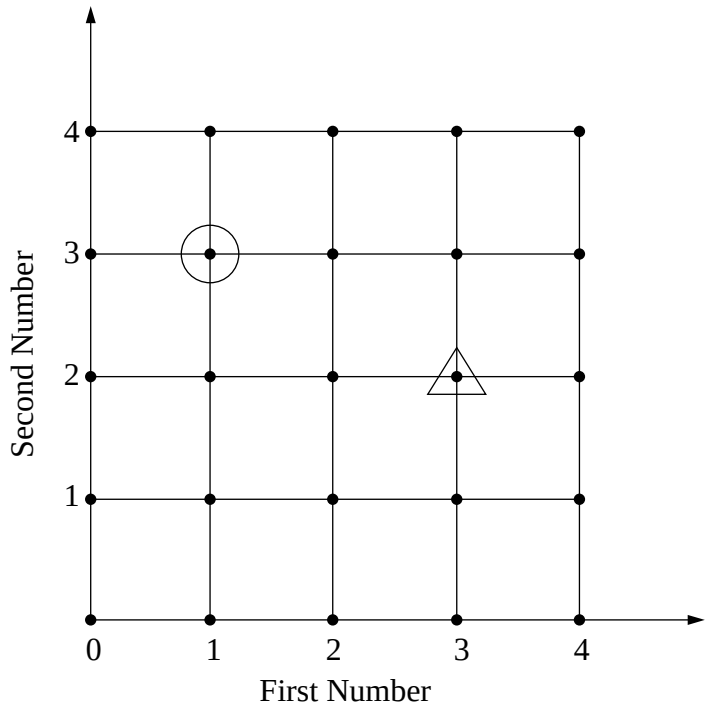
D. $7 +$ ☐

E. ☐ $\div 7$

M-3

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Whole Numbers	Knowing	63%	53%	524

M4. On this grid, find the dot with the circle around it. We can describe where this dot is by saying it is at First Number 1, Second Number 3



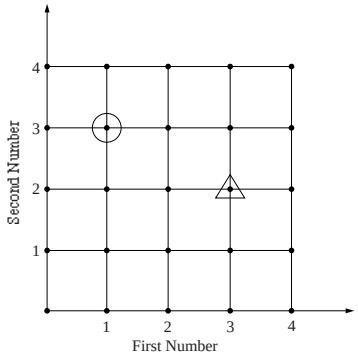
Now find the dot with the triangle around it. Describe where the dot is on the grid in the same way. Fill in the numbers we would use:

First number _____ Second Number _____

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Geometry	Solving Problems	42%	30%	626

M-4 Coding Guide

M4. On this grid, find the dot with the circle around it. We can describe where this dot is by saying it is at First Number 1, Second Number 3

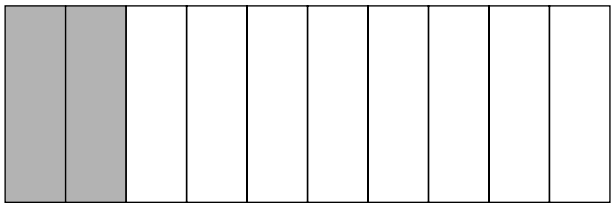


Now find the dot with the tangle around it. Describe where the dot is on the grid in the same way. Fill in the numbers we would use:

First number _____ Second Number _____

Code	Response
Correct Response	
10	3 and 2, in this order
Incorrect Response	
70	2 and 3, in this order
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

M5.



Which number represents the shaded part of the figure?

A. 2.8

B. 0.5

C. 0.2

D. 0.02

M-5

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	C	Fractions and Proportionality	Knowing	40%	33%	623

M6. John wanted to use his calculator to add 1463 and 319. He entered 1263 + 319 by mistake. What could he do to correct his mistake?

A. Add 200.

B. Add 2.

C. Subtract 2.

D. Subtract 200.

M-6

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Whole Numbers	Solving Problems	70%	57%	493

M7. Which of these would most likely be measured in milliliters?

A. The amount of liquid in a teaspoon

B. The weight (mass) of a pin

C. The amount of gasoline in a tank

D. The thickness of 10 sheets of paper

M-7

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Measurement, Estimation, and Number Sense	Knowing	38%	30%	624

M8. Which of these is the largest number?

A. 2735

B. 2537

C. 2573

D. 2753

M-8

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	D	Whole Numbers	Using Complex Procedures	86%	76%	381

M9. Here is a number sentence.

$4 \times \square < 17$

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

A. 4

B. 5

C. 12

D. 13

M-9

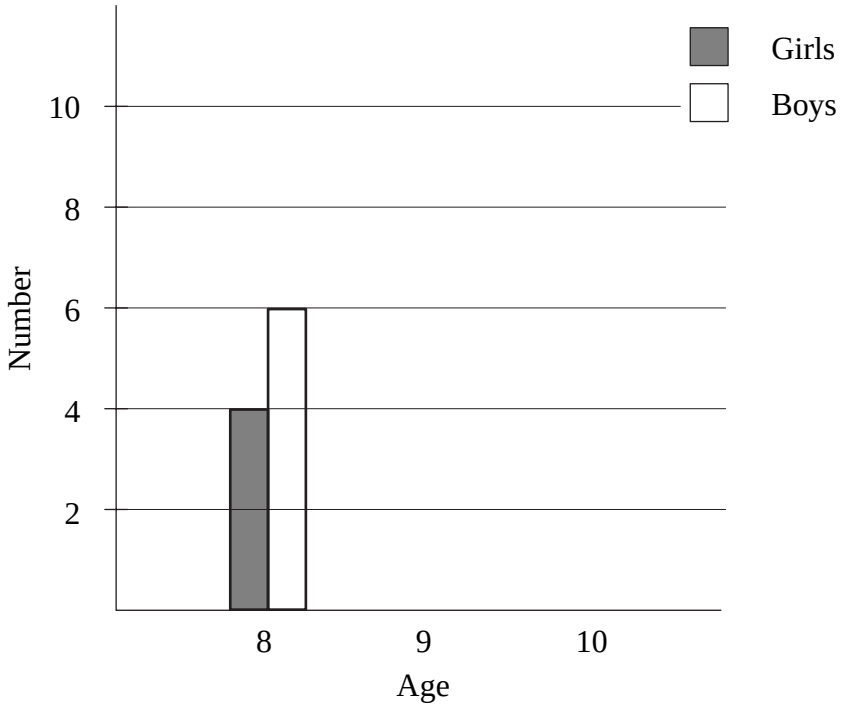
Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Patterns, Relations, and Functions	Performing Routine Procedures	70%	55%	493

S1. This table shows the ages of the girls and boys in a club.

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

S-1

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



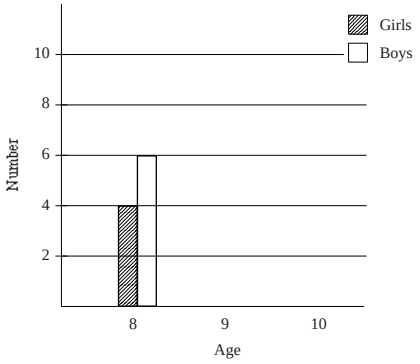
Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Data Representation, Analysis, and Probability	Using Complex Procedures	41%	24%	616

S-1 Coding Guide

S1. This table shows the ages of the girls and boys in a club.

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

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



Code	Response
Correct Response	
20	All 4 bars correct for height, placement, and shading.
21	All 4 bars of correct height; either bars misplaced or bars shaded incorrectly in no more than one set (i.e., for age 9 or age 10).
Partial Response	
10	Placement, shading, and height all correct for one, two, or three bars. (At least one bar completely correct).
11	All 4 bars of correct height, but two or more errors involving placement or shading.
Incorrect Response	
70	Work is shown, but no bars are drawn. For example: only numbers are shown on the graph.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

S2. Here is a number sentence.

$2000 + \square + 30 + 9 = 2739$

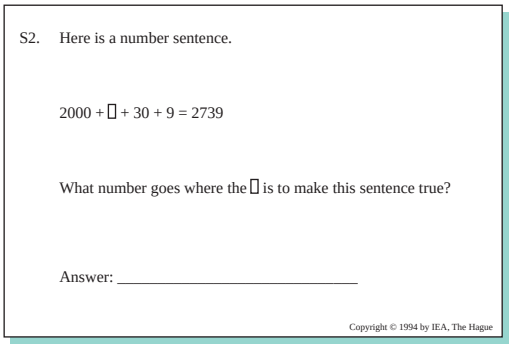
What number goes where the $\square$ is to make this sentence true?

Answer: _____

S-2

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Whole Numbers	Performing Routine Procedures	63%	44%	530

S-2 Coding Guide


S2. Here is a number sentence.

2000 + □ + 30 + 9 = 2739

What number goes where the □ is to make this sentence true?

Answer: _____

Code	Response
Correct Response	
10	700 or written out as "seven hundred."
Incorrect Response	
70	7
71	43
72	70
73	Gives other numbers made by digits in 2739 such as 73, 30, 9, 39, 739, 2739,...
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

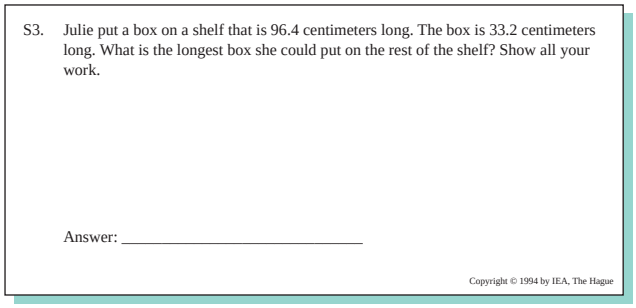
S3. Julie put a box on a shelf that is 96.4 centimeters long. The box is 33.2 centimeters long. What is the longest box she could put on the rest of the shelf? Show all your work.

Answer: _____

S-3

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Fractions and Proportionality	Solving Problems	26%	12%	684

S-3 Coding Guide


S3. Julie put a box on a shelf that is 96.4 centimeters long. The box is 33.2 centimeters long. What is the longest box she could put on the rest of the shelf? Show all your work.

Answer: _____

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

Code	Response
Correct Response	
20	63.2. The calculation will be "96.4 - 33.2" or its equivalent.
Partial Response	
10	63.2. No acceptable description or calculation is shown.
11	The calculation "96.4 - 33.2," or equivalent, is shown but the answer is incorrect.
19	Other partial.
Incorrect Response	
70	Any incorrect numerical answers (answers not equal to 63.2). No acceptable description or calculation is shown.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

S4. A teacher marks 10 of her pupils' tests every half hour. It takes her one and one-half hours to mark all her pupils' tests. How many pupils are in her class?

Answer: _____

S-4

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Fractions and Proportionality	Solving Problems	46%	30%	583

S-4 Coding Guide

S4. A teacher marks 10 of her pupils' tests every half hour. It takes her one and one-half hours to mark all her pupils' tests. How many pupils are in her class?

Answer: _____

Code	Response
Correct Response	
10	30
Incorrect Response	
70	10
71	15
72	20
73	21
74	25
75	40
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

S5. Here is a paper clip.

← Length →

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

S-5

Answer: _____

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Measurement, Estimation, and Number Sense	Using Complex Procedures	48%	34%	570

S-5 Coding Guide

S5. Here is a paper clip.

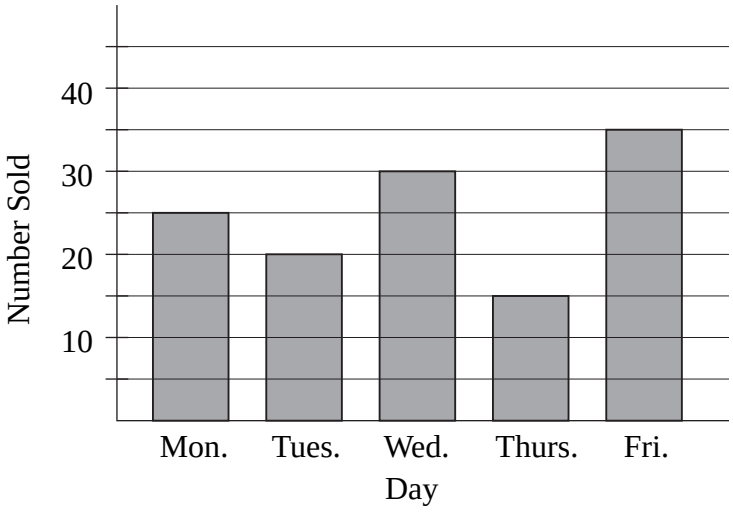
← Length →

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

Answer: _____

Code	Response
Correct Response	
10	4
11	5
19	Within the interval 4<X<5.5.
Incorrect Response	
70	Less than 3.
71	Within the interval 3<X<4.
72	Within the interval 5.5<X<6.5.
73	Within the interval 6.5<X<8.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

T1. The graph shows the number of cartons of milk sold each day of a week at a school.



T-1a

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

Answer: _____

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

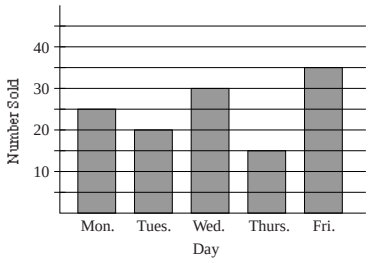
Answer: _____

Part a

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Data Representation, Analysis, and Probability	Solving Problems	75%	60%	468

T-1a Coding Guide

T1. The graph shows the number of cartons of milk sold each day of a week at a school.



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

Answer: _____

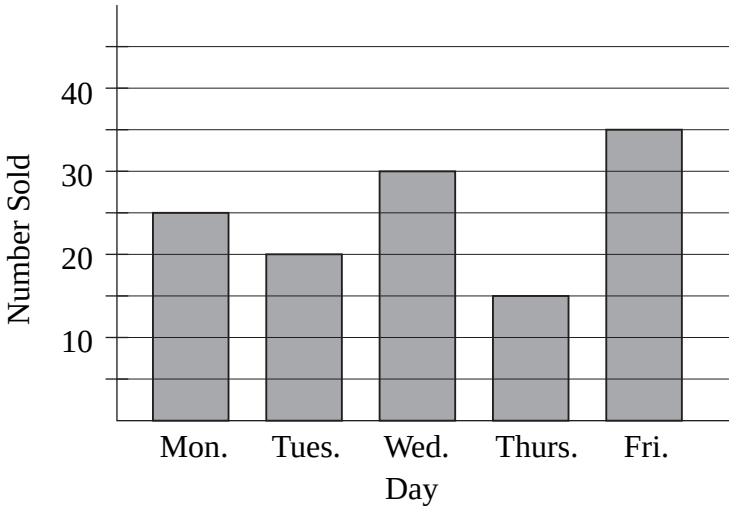
How many cartons of milk did the school sell that week?
Show your work.

Answer: _____

Codes for Part a

Code	Response
Correct Response	
10	25
Incorrect Response	
70	5
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

T1. The graph shows the number of cartons of milk sold each day of a week at a school.



T-1b

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

Answer: _____

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

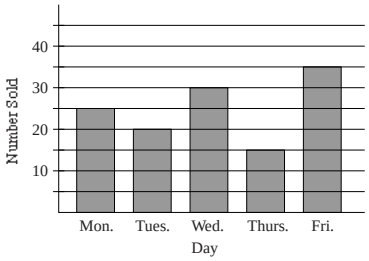
Answer: _____

Part b

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Data Representation, Analysis, and Probability	Solving Problems	37%	19%	639

T-1b Coding Guide

T1. The graph shows the number of cartons of milk sold each day of a week at a school.



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

Answer: _____

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

Answer: _____

Codes for Part b

Code	Response
Correct Response	
20	125. Calculation is shown.
21	125. Verbal explanation of correct procedure.
29	Other correct.
Partial Response	
10	The addition task is shown, but a calculation error was made and answer is incorrect but is other than 115 or 135 (see code 70).
11	125. No work shown.
19	Other partial.
Incorrect Response	
70	115 OR 135. Note: If correct addition task is shown, use code 11.
71	25
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

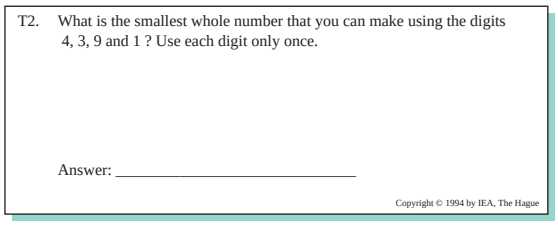
T2. What is the smallest whole number that you can make using the digits 4, 3, 9 and 1 ? Use each digit only once.

Answer: _____

T-2

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Whole Numbers	Solving Problems	43%	29%	614

T-2 Coding Guide



Code	Response
Correct Response	
10	1349
Incorrect Response	
70	1,3,4,9
71	1
72	4
73	17
74	Any four-digit number with digits 4,3,9 and 1, other than 1349
75	13 OR "1 and 3" OR "3 and 1"
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

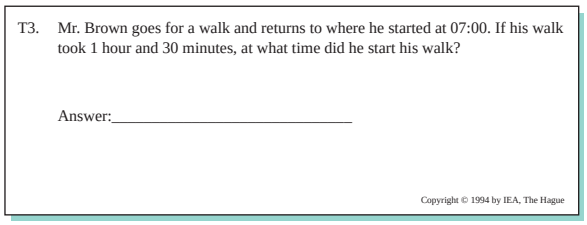
T3. Mr. Brown goes for a walk and returns to where he started at 07:00. If his walk took 1 hour and 30 minutes, at what time did he start his walk?

Answer:_____

T-3

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Measurement, Estimation, and Number Sense	Performing Routine Procedures	47%	32%	593

T-3 Coding Guide


T3. Mr. Brown goes for a walk and returns to where he started at 07:00. If his walk took 1 hour and 30 minutes, at what time did he start his walk?

Answer:_____

Code	Response
Correct Response	
10	05:30 OR 5:30
11	The answer expressed informally. *Example: "half past five"*
Incorrect Response	
70	04:30, 4:30, or equivalent informal expression.
71	06:00, 6:00, or equivalent informal expression.
72	06:30, 6:30, or equivalent informal expression.
73	08:30, 8:30, or equivalent informal expression.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

T4. There are 10 girls and 20 boys in Juanita's class. Juanita said that there is one girl for every two boys. Her friend Amanda said that means $\frac{1}{2}$ of all the students in the class are girls.

How many students are there in Juanita's class. Answer: _____

Is Juanita right? Answer: _____
Use words or pictures to explain why.

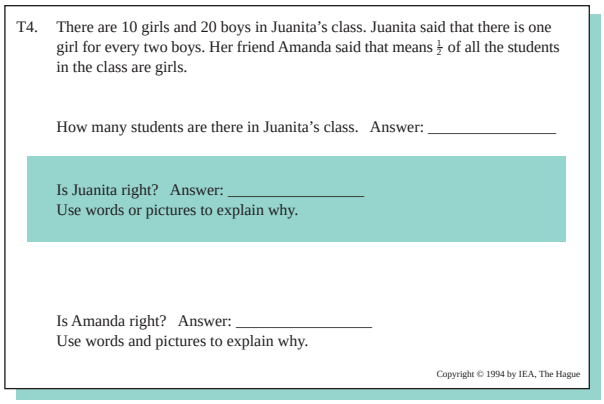
T-4a

Is Amanda right? Answer: _____
Use words and pictures to explain why.

Part a

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Fractions and Proportionality	Solving Problems	21%	10%	745

T-4a Coding Guide



T4. There are 10 girls and 20 boys in Juanita's class. Juanita said that there is one girl for every two boys. Her friend Amanda said that means $\frac{1}{2}$ of all the students in the class are girls.

How many students are there in Juanita's class. Answer: _____

Is Juanita right? Answer: _____
Use words or pictures to explain why.

Is Amanda right? Answer: _____
Use words and pictures to explain why.

Codes for Part a

Code	Response
Correct Response	
10	YES. The response expresses verbally, symbolically or pictorially that 20 is twice as much as 10, or that 10 is half of 20.
19	Other correct. (Includes satisfactory explanations when neither a "yes" or "no" answer is given).
Incorrect Response	
70	NO. An explanation is given but is not satisfactory.
71	NO. No explanation is given.
72	YES. An explanation is given but is not satisfactory.
73	YES. No explanation is given.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

T4. There are 10 girls and 20 boys in Juanita's class. Juanita said that there is one girl for every two boys. Her friend Amanda said that means $\frac{1}{2}$ of all the students in the class are girls.

How many students are there in Juanita's class. Answer: _____

Is Juanita right? Answer: _____
Use words or pictures to explain why.

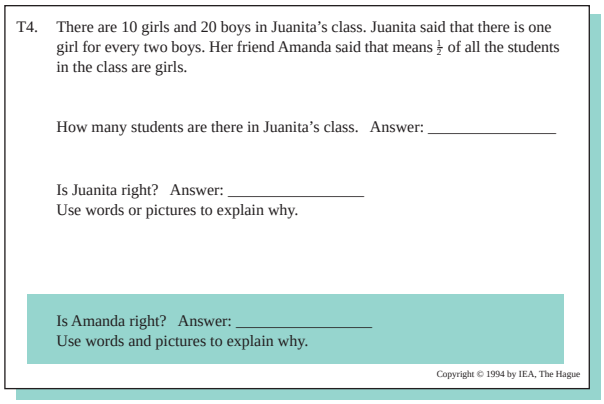
T-4b

Is Amanda right? Answer: _____
Use words and pictures to explain why.

Part b

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Fractions and Proportionality	Solving Problems	15%	6%	796

T-4b Coding Guide



T4. There are 10 girls and 20 boys in Juanita's class. Juanita said that there is one girl for every two boys. Her friend Amanda said that means $\frac{1}{2}$ of all the students in the class are girls.

How many students are there in Juanita's class. Answer: _____

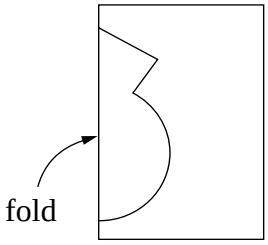
Is Juanita right? Answer: _____
Use words or pictures to explain why.

Is Amanda right? Answer: _____
Use words and pictures to explain why.

Codes for Part b

Code	Response
Correct Response	
10	NO. The response expresses verbally, symbolically or pictorially that 10 is not half of 30.
19	Other correct. (Includes satisfactory explanations when neither a "yes" or "no" answer is given).
Incorrect Response	
70	YES. An explanation is given but it is not satisfactory.
71	YES. No explanation is given.
72	NO. An explanation is given but it is not satisfactory.
73	NO. No explanation is given.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

T5. Craig folded a piece of paper in half and cut out a shape.



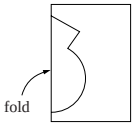
Draw a picture to show what the cut-out shape will look like when it is opened up and flattened out.

T-5

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Geometry	Knowing	59%	45%	520

T-5 Coding Guide

T5. Craig folded a piece of paper in half and cut out a shape.

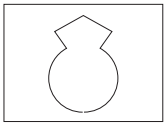


Draw a picture to show what the cut-out shape will look like when it is opened up and flattened out.

A

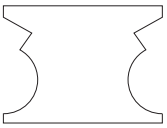
Code 10

B



Code 11

C



Code 70

D

Code 71

E

F

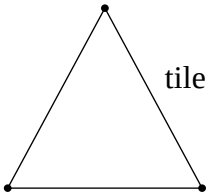
G

Code 72

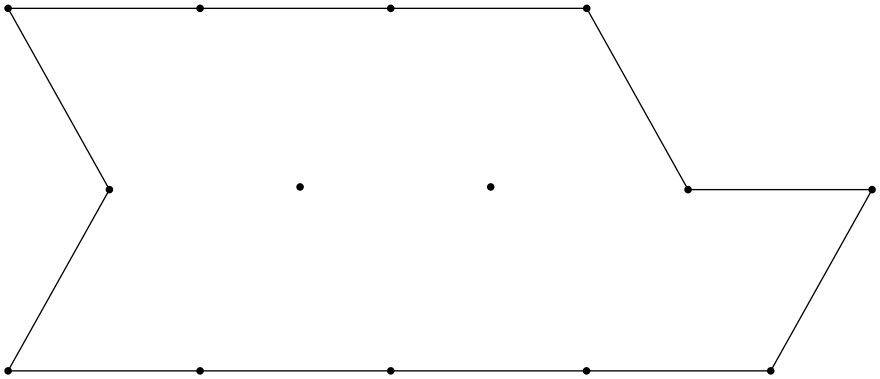
Note: See the examples above. The accuracy in drawing is not important, nor is the size of the figure.

Code	Response
Correct Response	
10	The drawing of the cut-out shape corresponds to figure A.
11	The drawing of the remaining piece of paper corresponds to figure B.
19	Other correct.
Incorrect Response	
70	Drawing corresponds to figure C.
71	Drawing corresponds to figure D.
72	Drawings correspond to figures E or F or G.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

U1. The triangle represents one tile in the shape of a triangle.



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

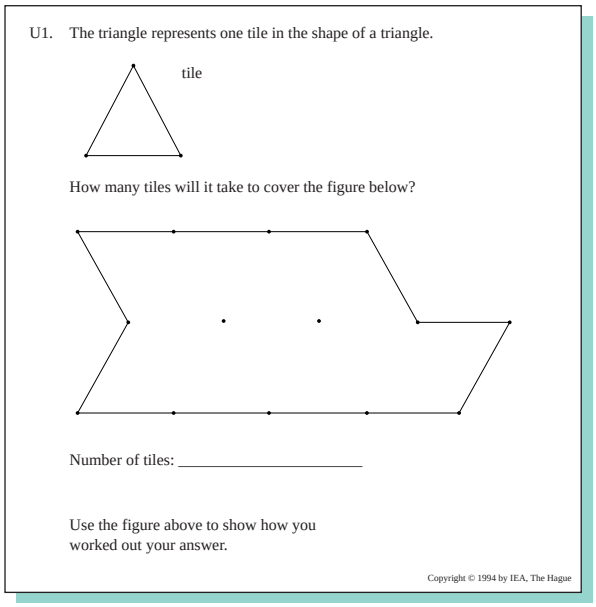


Number of tiles: _____

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

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Measurement, Estimation, and Number Sense	Solving Problems	50%	36%	576

U-1 Coding Guide



Code	Response
Correct Response	
20	14. Figure is correctly partitioned.
Partial Response	
10	14. Partition includes errors.
11	14. Partition is not shown.
12	The figure is correctly partitioned. Triangles are miscounted. (Count does not equal 14.)
Incorrect Response	
70	Neither partition nor number of triangles is correct.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

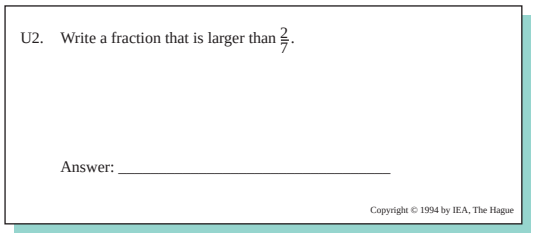
U2. Write a fraction that is larger than $\frac{2}{7}$.

Answer: _____

U-2

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Fractions and Proportionality	Knowing	57%	41%	564

U-2 Coding Guide



Code	Response
Correct Response	
10	A fraction with numerator greater than 2 and denominator equal to 7
11	A fraction with numerator equal to 2 and denominator less than 7
12	3/8
13	1/2. (Other fractions with numeric value equal 1/2 should be coded 19.)
19	Other correct fraction.
Incorrect Response	
70	1/7
71	4/14
72	2/8
79	Other incorrect
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

U3. Maria and her sister Louisa leave home at the same time and ride their bicycles to school 9 kilometers away.

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

Answer: _____ minutes

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

Answer: _____ minutes

Who arrives at school first?

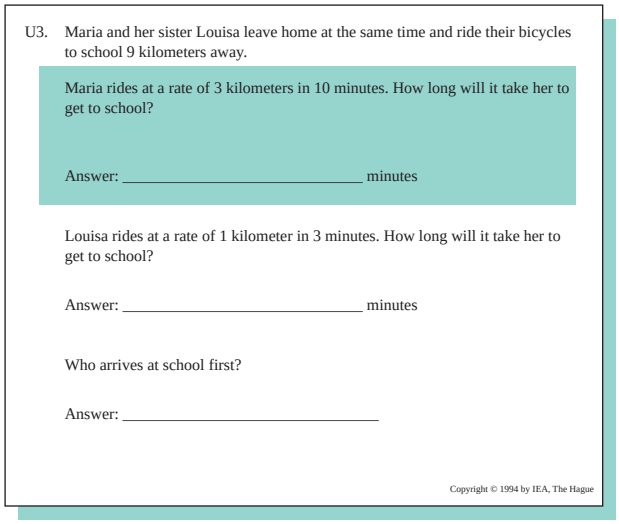
Answer: _____

U-3a

Part a

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Fractions and Proportionality	Solving Problems	61%	44%	534

U-3a Coding Guide



U3. Maria and her sister Louisa leave home at the same time and ride their bicycles to school 9 kilometers away.

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

Answer: _____ minutes

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

Answer: _____ minutes

Who arrives at school first?

Answer: _____

Codes for Part a

Code	Response
Correct Response	
10	30
Incorrect Response	
70	10
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

U3. Maria and her sister Louisa leave home at the same time and ride their bicycles to school 9 kilometers away.

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

Answer: _____ minutes

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

Answer: _____ minutes

Who arrives at school first?

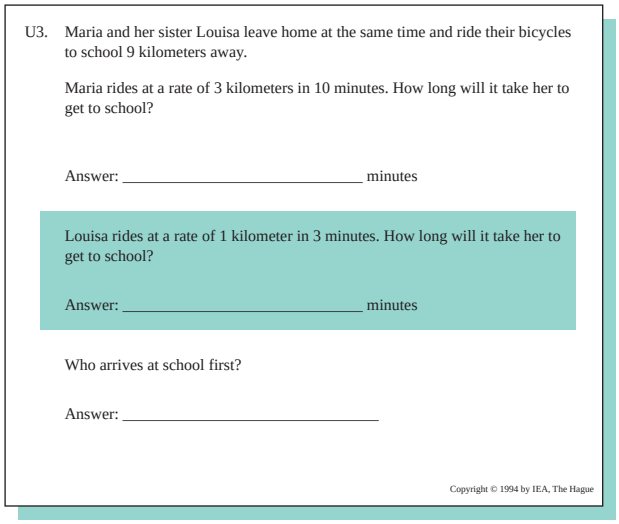
Answer: _____

U-3b

Part b

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Fractions and Proportionality	Solving Problems	45%	28%	618

U-3b Coding Guide



U3. Maria and her sister Louisa leave home at the same time and ride their bicycles to school 9 kilometers away.

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

Answer: _____ minutes

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

Answer: _____ minutes

Who arrives at school first?

Answer: _____

Codes for Part b

Code	Response
Correct Response	
10	27
Incorrect Response	
70	Any other multiple of 3.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

U3. Maria and her sister Louisa leave home at the same time and ride their bicycles to school 9 kilometers away.

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

Answer: _____ minutes

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

Answer: _____ minutes

Who arrives at school first?

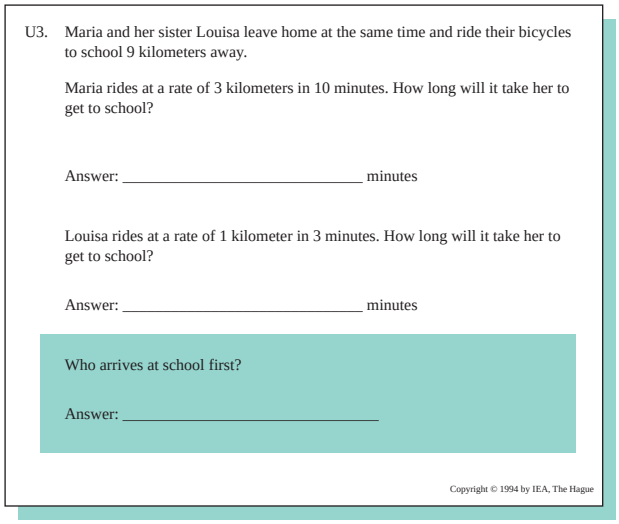
Answer: _____

U-3c

Part c

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Fractions and Proportionality	Solving Problems	73%	61%	445

U-3c Coding Guide



U3. Maria and her sister Louisa leave home at the same time and ride their bicycles to school 9 kilometers away.

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

Answer: _____ minutes

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

Answer: _____ minutes

Who arrives at school first?

Answer: _____

Codes for Part c

Code	Response
Correct Response	
10	Louisa
11	Maria (or other responses), in cases where the response is consistent with (a) and (b).
Incorrect Response	
70	Inconsistent with part (a) or (b) or both.
79	Other incorrect
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

U4. These numbers are part of a pattern.

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

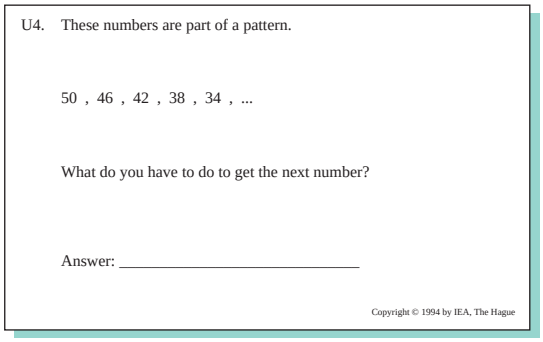
What do you have to do to get the next number?

Answer: _____

U-4

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Patterns, Relations, and Functions	Knowing	57%	41%	552

U-4 Coding Guide


U4. These numbers are part of a pattern.

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

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

Answer: _____

Code	Response
Correct Response	
10	"The number decreases by 4".
11	30 OR 30,26,22,. . .
19	Other correct.
Incorrect Response	
70	Indicates an increase by 4
71	Focuses on the number 4. No indication of increase or decrease.
79	Other incorrect, includes decreases by 4 that are wrong numbers in the pattern.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

U5.

Addition Fact
4 + 4 + 4 + 4 + 4 = 20

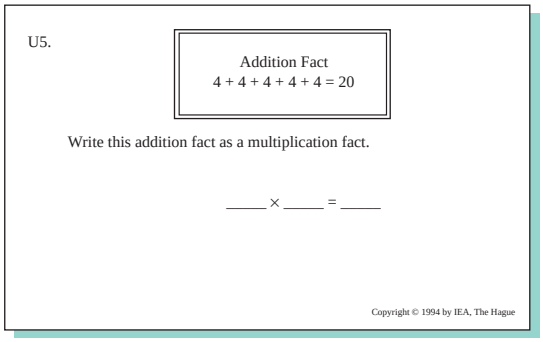
Write this addition fact as a multiplication fact.

_____ × _____ = _____

U-5

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Whole Numbers	Knowing	77%	63%	418

U-5 Coding Guide

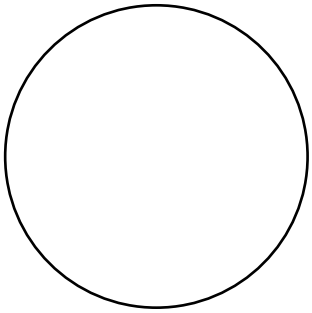


Code	Response
Correct Response	
10	5x4=20
11	4x5=20
19	Other correct
Incorrect Response	
70	4x4=16
71	4x4=20
72	10x2=20 OR 2x10=20
79	Other incorrect
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

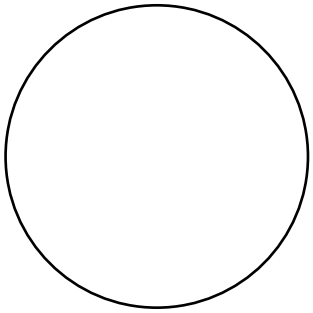
V1. Sam said that $\frac{1}{3}$ of a pie is less than $\frac{1}{4}$ of the same pie.

Is Sam correct? _____

Use the circles below to show why this is so.



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

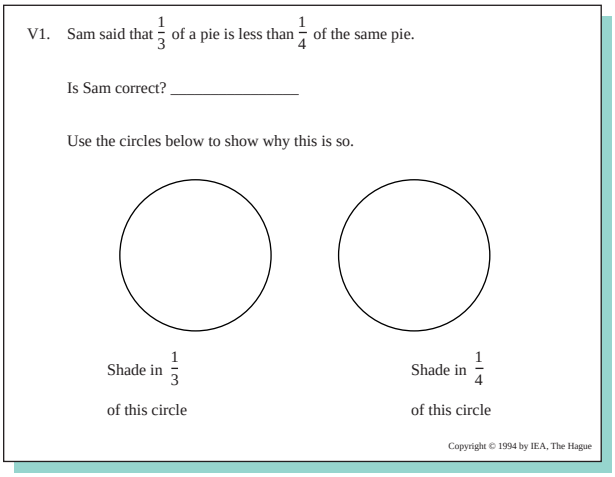


Shade in $\frac{1}{4}$
of this circle

V-1

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Fractions and Proportionality	Solving Problems	26%	13%	686

V-1 Coding Guide



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

Code	Response
Correct Response	
20	NO. Both circles are correctly partitioned.
Partial Response	
10	NO. No partitioning is shown.
11	NO. Only one of the circles correctly partitioned.
12	NO. Other incorrect ways of partitioning.
13	YES, or there is no conclusion stated. Both circles are correctly partitioned.
19	Other partial.
Incorrect Response	
70	YES. No partitioning is shown.
71	YES. The part representing 1/3 is made consistently smaller than the part representing 1/4.
72	YES. Other responses where one or both of the circles partitioned into 3 and/or 4 parts.
79	Other incorrect.
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

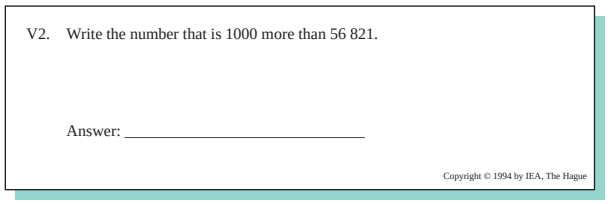
V2. Write the number that is 1000 more than 56 821.

Answer: _____

V-2

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Whole Numbers	Knowing	48%	30%	603

V-2 Coding Guide



Code	Response
Correct Response	
10	57821
Incorrect Response	
70	66821
71	Any number except 66821 where one or more digits in 56821 have been increased by 1. *Example: 56921, 66932, 57921*
79	Other incorrect
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

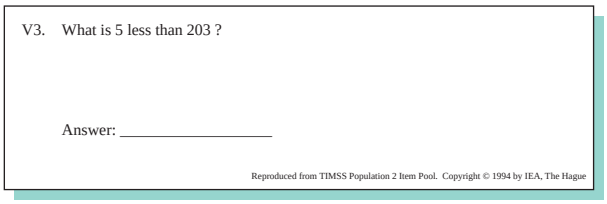
V3. What is 5 less than 203 ?

Answer: _____

V-3

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Whole Numbers	Performing Routine Procedures	62%	48%	519

V-3 Coding Guide



Note: There is no code 19 for this item.

Code	Response
Correct Response	
10	198
Incorrect Response	
70	98 OR 298
71	5
72	208
79	Other incorrect
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

V4. In a game, Mysong and Naoki are making addition problems. They each have four cards like these.

1	2	3	4

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

Mysong placed the cards like this.

$$\begin{array}{r} 4\ 3 \\ +\ 2\ 1 \\ \hline \end{array}$$

Naoki placed the cards like this.

$$\begin{array}{r} 3\ 1 \\ +\ 2\ 4 \\ \hline \end{array}$$

Who won this game? _____

How do you know? _____

_____

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

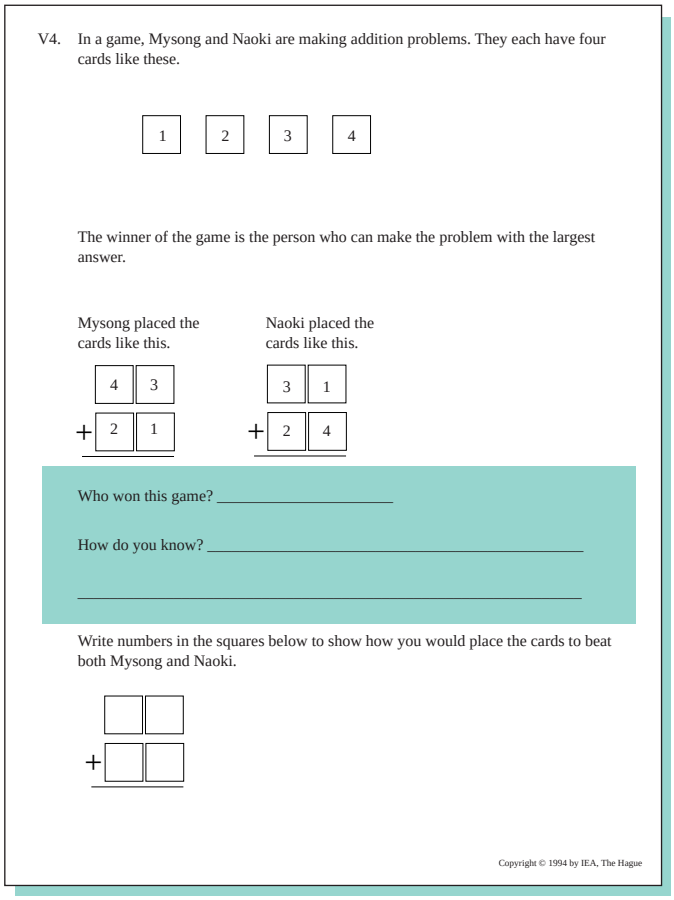
$$\begin{array}{r} \square\ \square \\ +\ \square\ \square \\ \hline \end{array}$$

V-4a

Part a

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Whole Numbers	Solving Problems	24%	16%	698

V-4a Coding Guide



V4. In a game, Mysong and Naoki are making addition problems. They each have four cards like these.

1	2	3	4

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

Mysong placed the cards like this.

4	3
+ 2	1

Naoki placed the cards like this.

3	1
+ 2	4

Who won this game? _____

How do you know? _____

_____

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

+	

Codes for Part a

Code	Response
Correct Response	
20	Mysong. 64 and 55 are shown (or 9 which is the difference between 64 and 55) with a correct verbal explanation.
Partial Response	
10	Mysong. The response given is a verbal explanation. Either 64 or 55 is shown but not both.
11	Mysong. The response gives no verbal or numeric explanation.
12	Mysong. 64 and 55 are shown (or 43 - 31 > 24 - 21) with an unsatisfactory explanation.
13	Mysong. 64 and 55 are shown (or 43 - 31 > 24 - 21) without any further explanation.
19	Other responses containing Mysong. For example, “because Mysong had the largest answer.”
Incorrect Response	
70	Neither Mysong nor Naoki win.
71	Naoki. There may or may not be an explanation.
79	Other incorrect, including “both won.”
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

V4. In a game, Mysong and Naoki are making addition problems. They each have four cards like these.

1	2	3	4

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

Mysong placed the cards like this.

$$\begin{array}{r} 4\ 3 \\ +\ 2\ 1 \\ \hline \end{array}$$

Naoki placed the cards like this.

$$\begin{array}{r} 3\ 1 \\ +\ 2\ 4 \\ \hline \end{array}$$

Who won this game? _____

How do you know? _____

_____

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

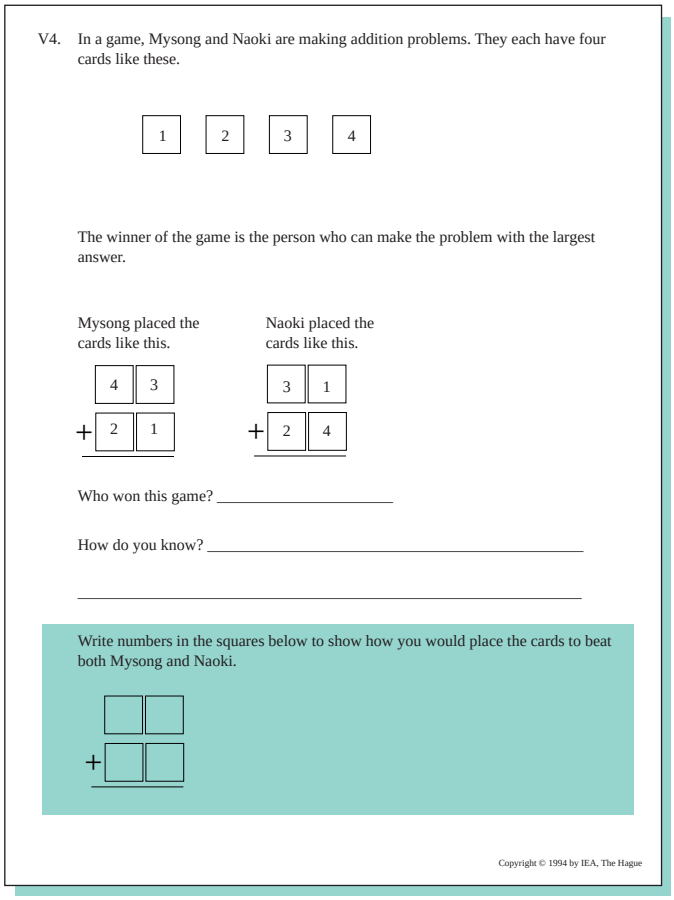
$$\begin{array}{r} \square\ \square \\ +\ \square\ \square \\ \hline \end{array}$$

V-4

Part b

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Whole Numbers	Solving Problems	48%	31%	590

V-4b Coding Guide



V4. In a game, Mysong and Naoki are making addition problems. They each have four cards like these.

1 2 3 4

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

Mysong placed the cards like this.

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

Naoki placed the cards like this.

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

Who won this game? _____

How do you know? _____

_____

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

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

Codes for Part b

Code	Response
Correct Response	
10	One of the following: 42+31; 41+32; 31+42; or 32+41
Incorrect Response	
70	Combinations of the numbers 1, 2, 3 and 4. Every number is used only once.
71	Combinations of the numbers 1, 2, 3 and 4. One or more numbers are used more than once.
72	Combinations containing one or more numbers other than 1, 2, 3 and 4
79	Other incorrect
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK

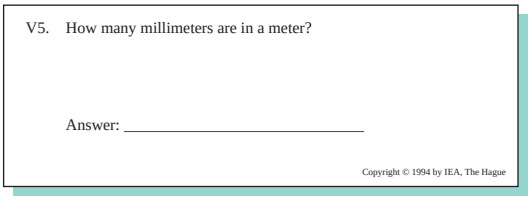
V5. How many millimeters are in a meter?

Answer: _____

V-5

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	Next Page	Measurement, Estimation, and Number Sense	Knowing	49%	31%	585

V-5 Coding Guide



Code	Response
Correct Response	
10	1000
11	Thousand or "one thousand."
Incorrect Response	
70	10
71	60
72	100
73	10000
79	Other incorrect
Nonresponse	
90	Crossed out/erased, illegible or impossible to interpret.
99	BLANK