



UNITED STATES DEPARTMENT OF EDUCATION

OFFICE OF THE DEPUTY SECRETARY

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FAX COVER SHEET

TO: Bill Kincaid

FROM: JUDY WURTZEL

FAX: 456-7028NUMBER OF PAGES TO FOLLOW, INCLUDING COVER SHEET: 2IF YOU DID NOT RECEIVE THE COMPLETE TRANSMISSION, PLEASE CALL
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MESSAGE:

President's Message

Mathematics Is Alive and Well

Gail Burrill

Mathematics is important, but I don't really use it in my job. "I took algebra in high school but haven't used it since." "Why did we take that stuff? I have never used any of it." I often hear statements like these from parents, my neighbors, and people next to me on airplanes.

Is it really true that mathematics is taught but little used? A 1996 Society for Industrial and Applied Mathematics (SIAM) report confirms that "mathematics is alive and well, but living under different names." Perhaps this is why it is difficult to find many people outside the world of mathematics who think they actually use it. Many people don't recognize the mathematics they encounter in their job or their everyday life as the mathematics they learned in school.

They do see addition of numbers and multiplication problems. Doing worksheets on fractions, applying geometry proofs, manipulating symbols, and solving word problems, however, seem to occur only in the life of a mathematics teacher. As a result, although most people recognize that learning mathematics is important, they really don't think they are doing mathematics themselves.

But just to read and understand the news from magazines and newspapers (as a sampling of recent articles confirms)—and even to make daily life decisions—requires a significant level of mathematical knowledge. For instance, an article about the risk of strokes (*Milwaukee Journal Sentinel*, 10 March 1997) included a formula for determining individual risk: $\text{Age} + \text{SBP} + \text{HYP RX} + \text{Diabetes} + \text{Cigarettes} + \text{CVD} + \text{AI} + \text{LVH} = \text{Total}$. The variables were defined as blood pressure (BP), medicine (HYP RX), history of heart disease (CVD, history of atrial fibrillation (AF), and enlarged heart (LVH). To use the formula, you have to determine each variable's appropriate value for your age and medical history from a series of charts. You then match your total to the values on a table of probabilities for a stroke.



Mathematics aids the understanding of history in a 12 March *Washington Post* article that compared the time line for the development of our world to the distance across the United States: "If a walk across the 2460-mile-wide continent (*sic*) is proportional to the history (age) of the planet, a single stride spans a millennium." In mathematics, we would write this as $\text{miles}/2460 = \text{time}/4.54 \text{ billion}$. Using the relation, you discover that, according to the article, the distance from Hill County, Va., (*sic*) to Warrenton, Va., represents the length of time that dinosaurs lived.

In the financial area, a graph (*Milwaukee Journal Sentinel*, 3 November 1996) depicts the year, the money in the Social Security Trust Fund, and the number of workers for each recipient of benefits. If the rate of change remains constant, you can project that the trust fund will be gone in 2029—which explains why politicians are concerned about the fate of Social Security. Last November, many newspapers ran articles about the change in rates proposed by America Online, from \$19.95 for five hours plus \$2.95 an hour thereafter to a flat rate of \$14.95 a month. In algebraic terms, $y = 19.95 + 2.95(x - 5)$ and $y = 14.95$ where the number of hours of use, x , is greater than 5. Subscribers were concerned whether this was a good deal. Was it?

In sports, golf pro Paul Azinger uses high tech to study his game (*USA Today*, 4 March 1997). He wants a 1.5 to 1 ratio of ball speed to swing speed. With a swing speed of 117 mph, he had to find the appropriate ball speed—175 mph, or algebraically,

$$\frac{1.5}{1} = \frac{x}{117}$$

Other articles discussed the geometry

involved in tennis and the use of formulas to maximize nutrition for distance runners.

Not all mathematics we see is correct, and we have to be attuned to that as well. A graph of currency depreciation and economic growth (*Forbes*, 21 October 1996) for 41 countries included a regression line and the headline "Weak Currency, Weak Economy." The author confused association with cause and effect, violating a fundamental lesson in statistics. Overseas, ignorance of how probability works in a pyramid scheme was a major factor in the recent collapse of Albania's economy.

The mathematics people encounter in their daily lives involves number and measurement, algebra and geometry, and statistics and probability.

The mathematics called for in the *Curriculum and Evaluation Standards* sets the stage for tying the mathematics learned in school to what people really do in the world. Old words have enhanced meanings. Algebra is more than manipulating

symbols; it is representing situations with variables and understanding how to use them. Geometry is not just proofs; it is looking at the geometry in the world around you and thinking about the relationships between shapes and structures. Computation is not just finding products or quotients; it is using very big and very small numbers in meaningful ways to read and make inferences from data in tables and to understand common statements in the news, such as "Women gain on male pay." (A woman's average 1995 pay is about 71 percent of a man's average pay: \$22 500 to \$31 500 [*USA Today*, 7 April 1997].)

The concepts we taught before are still important. But it is also important for people to see how those concepts relate to what they do in their life—and that mathematics does not exist just on a page in a textbook. We need to help them see the mathematics they do as the mathematics we teach.

Mathematics is alive and well—and we need to let the world in on the secret.

4TH STORY of Level 1 printed in FULL format.

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The Washington Post

March 25, 1997, Tuesday, Final Edition

SECTION: METRO; Pg. B01

LENGTH: 807 words

HEADLINE: Va. Releases Sample Test Questions; Exams Too Difficult, Some Educators Say

BYLINE: Jay Mathews, Washington Post Staff Writer

BODY:

Virginia officials have released sample questions for new statewide tests to be given to public school students, heightening some educators' concern that Gov. George Allen's standards program is too demanding for elementary school children.

The tests, designed to show whether students are meeting revised state curriculum standards, will consist mostly of multiple-choice questions, officials said. In contrast, Maryland's learning standards tests rely on essay questions and free-form problem-solving.

All Virginia public school students in grades 3, 5, 8 and 11 will take at least one of four subject tests the week of April 28. State officials say they are just testing the questions and will not report any child's score.

But the results of next year's tests will count, and passing the 11th-grade exam will become a graduation requirement for the Class of 2001. In addition, state officials have proposed that schools with consistently low student scores face the threat of a state takeover.

The sample questions, which the state mailed to Northern Virginia districts last week, may be too difficult for grade-school students, some local school officials said yesterday.

The questions for third-graders ask students to comprehend reading passages at least as long as those in college entrance tests and to judge the proper sequence of ideas in a paragraph. A fifth-grade social studies question shows, but does not name, four major Virginia rivers on a map and asks which one the first Virginia settlement was near.

Kathleen Wills, coordinator for planning and assessment for Arlington schools, said she is "convinced that the test will be difficult," because of the skills being tested and because of students' lack of preparation. The state's new curriculum standards were approved in 1995 but did not take effect until last fall.

"Third-graders are going to take a test that assumes that they have had the kindergarten, first- and second-grade curriculum, which they have not had," Wills said.

Maryanne Roesch, director of educational planning services and program evaluation for Fairfax County schools, said the new tests also increase considerably the time Fairfax students will spend taking examinations.

State education officials and representatives of the San Antonio-based Harcourt Brace Educational Management company, which produced the tests, will explain them to Northern Virginia school administrators at a meeting tomorrow in Culpeper.

Virginia's math, science and social studies tests, and all but one section of the English test, will be multiple-choice questions graded by computer. Maryland's state assessment tests, given in grades 3, 5 and 8, are not multiple-choice and are graded by independent groups of teachers. However, Maryland officials are leaning toward some multiple-choice questions in tests being designed as part of new high school graduation requirements.

The contrast between Virginia and Maryland reflects a national debate over how to change education in the United States.

The Virginia Board of Education is emphasizing the memorization of facts and high standards even for lower grades, in some cases introducing topics such as Egyptian history before some educators think children are ready.

Maryland's philosophy puts more emphasis on thinking skills and learning in cooperation with other children. Its approach is more popular than Virginia's among university researchers and professional education associations.

Virginia school board President Michelle Easton said board members decided the multiple-choice tests would be more reliable and equitable, with every child tested with the same questions under the same conditions.

"If the teacher has been teaching the standards since we have had them in 1995, I don't think the questions will be that difficult," she said. "If they haven't been teaching the standards, that might be a problem."

For such teachers, she said, next month's field test may serve as "a wake-up call."

Cameron Harris, Virginia's acting assistant superintendent for assessment and reporting, said she agreed that performance-based, free-response questions such as those on Maryland's test were good for classroom use. But she said they are expensive to score on a statewide basis.

The Virginia standards tests, she said, are designed more to test the qualities of each school, rather than each student, and a multiple-choice test seemed to be a good, economical alternative.

Monty Neill, associate director of the Cambridge, Mass.-based National Center for Fair and Open Testing, said he favored the Maryland approach.

"A state ought to make sure that its standards expect students not just to memorize and regurgitate but to understand deeply and show that they understand by using that knowledge," he said.

GRAPHIC: Chart, The Washington Post, MAKING THE GRADE Here are examples of the kinds of questions that Virginia students will be asked in tests designed to show whether they are meeting new state learning standards. State officials mailed the sample questions to local school administrators last week. The tests will be given in grades 3, 5, 8 and 11. GRADE 3 English Which word has the same vowel sound as make? A. march B. beak C. rain D. smack History and Social Science Robert E. Lee is to Lee/Jackson/King Day as Pilgrims are to . . . A. President's Day B. Independence Day C. Veterans Day D. Thanksgiving Day GRADE 5 Mathematics Which equation is true for all pairs of values shown in the table at right? A B 12 8 5 1 9 5 10 6 A. $B = 20 - A$ B. $B = A/5$ C. $B = A - 4$ D. $B = 60/A$ Computer/Technology On many computers, a blinking line or box displayed on the monitor is called the . . . A. blinking light B. place holder C. cursor D. computer bookmark GRADE 8 English/Writing The sentence "Greater demand for used paper goods cause the prices to go up" is correctly written . . . A. demand for used paper goods causes B. demand for used paper good are causing C. demands for used paper goods have caused D. as it is Mathematics Jinn-Hwa has a bag containing eight red marbles, six yellow marbles, four blue marbles, three green marbles and three white marbles. If she picks one marble out of the bag without looking, what is the probability it will be yellow? A. $1/6$ B. $1/5$ C. $1/4$ D. $1/3$ GRADE 11 Algebra I The velocity v , in meters per second, of a projectile fired into the water is given by $v = 150 + t - t/5$ where t is time in seconds. After how many seconds is the velocity of the projectile equal to 0? A. 25 B. 30 C. 50 D. 75 World History Each of the following contributed to the Golden Age of A

LANGUAGE: ENGLISH

LOAD-DATE: March 25, 1997

Math prob



UNITED STATES DEPARTMENT OF EDUCATION
OFFICE OF THE ASSISTANT SECRETARY
FOR EDUCATIONAL RESEARCH AND IMPROVEMENT

FAX COVER SHEET

DATE: 5.21

TIME: 2:00

TO: Bill Kincaid

FAX#: 456 7028

FROM: Messy

Number of pages including fax cover: 7

PLEASE CALL (202) 219-1335 IF THERE IS ANY PROBLEM IN TRANSMITTAL.

Special Comments:

Here is the 3 page fact sheet & 3 pages of
Math items. We're still working on reading -
Messy

Mastering the Basics: Reaching for High Standards in Reading & Math

Tonight, I issue a challenge to the nation: Every state should adopt high national standards, and by 1999, every state should test every 4th grader in reading and every 8th grader in math to make sure these standards are met. President Clinton, State of the Union Address, February 4, 1997

STANDARDS OF EXCELLENCE AND DISCIPLINE ARE ESSENTIAL IN OUR SCHOOLS. Strong schools with clear standards of achievement and discipline are essential to our children and our society. These standards are needed to help instill the skills, fundamental American values, and hard work that our children need to get on the right track. Toward that end we must establish meaningful standards for what the students should be expected to learn and achieve in the basics and core subjects.

A CHALLENGE TO EVERY STATE: MAKE SURE EVERY STUDENT MASTERS THE BASICS IN READING AND MATH. Every student should be able to read well and independently by the end of 3rd grade and start of 4th grade. And every student should understand the basics of math, including algebra and even some geometry, by the end of 8th grade. Reading and math skills provide the foundation for future learning. Research shows that students who fail to read English well by the end of grade 3 have a greater likelihood of dropping out and risk a diminished chance of success in school and in life. Students who master the basics of math, including the essentials of algebra and some geometry, by the end of grade 8 have the foundation to take tough math and science courses in high school to prepare for college and high-skills jobs.

NATIONAL TESTS IN 4TH GRADE READING AND 8TH GRADE MATH. Parents need to know that students have mastered the basics no matter where they live or move in this great country. The U.S. Department of Education will give every state and school district the opportunity to use the voluntary national tests of 4th grade reading and 8th grade math, beginning in 1999. These rigorous tests will provide scores for individual students, measured against widely accepted standards of excellence - - national and international standards - - that show whether students have mastered critical basic skills. This will be the first time rigorous tests of reading skills at grade 4 and math knowledge and skills at grade 8, tied to national standards, are available to measure individual student performance throughout the nation.

Every parent has the right to know how well his or her child is doing compared with students in other schools, states, and countries. These tests will help states and local communities raise standards of excellence for teaching and learning in every classroom, and provide parents with accurate information about their children's academic performance.

WIDELY RECOGNIZED TESTS LINKED TO WIDELY RECOGNIZED NATIONAL AND INTERNATIONAL STANDARDS. These new tests will be based on existing widely accepted tests: the National Assessment of Educational Progress (NAEP) 4th grade reading and 8th grade math tests. In addition, the 8th grade math test will be linked to the 8th grade math test used in the Third International Mathematics and Science Study (TIMSS). Currently, the NAEP and TIMSS tests are used to assess the overall performance of the nation as a whole and of interested states. In their current form, they cannot be used to measure the academic performance of individual students.

The NAEP reading and math tests are based on widely accepted content standards -- developed by teachers, reading and math specialists, curriculum specialists, parents, and researchers -- reflecting a national consensus on what students should know and be able to do when they reach the 4th grade in reading and the 8th grade in math. The NAEP math standards are highly consistent with the national math standards developed by the National Council of Teachers of Mathematics (NCTM), which are used extensively by virtually every state.

The TIMSS test is also based on widely accepted content standards -- in this case developed by the representatives of the 41 participating countries -- reflecting an international consensus on what students should know and be able to do in mathematics by 8th grade.

A NEW GENERATION OF TESTS MEASURING INDIVIDUAL STUDENTS AS WELL AS STATES. The current NAEP and TIMSS tests are designed to assess how the entire nation, or individual states, perform in reading and math. They do not show how individual students perform. The tests are administered to a sample of students in participating states, rather than to all students. Each student in the sample takes only a portion of the total test questions. As a result, no student or parent currently receives a score from these tests.

President Clinton's plan is to make this opportunity of high quality 4th grade reading and 8th grade math tests available to interested schools and states so that students, parents, and teachers will have meaningful scores comparing individual student performance to these widely accepted national and international standards.

THESE TESTS WILL BE RIGOROUS AND CHALLENGING. Though the focus is on basic skills, these tests are challenging, not low level. While many U.S. fourth graders perform reasonably well in international comparisons of reading, 40 percent of our students do not reach the "basic" achievement level on the NAEP reading assessment. In TIMSS, the U.S. average score is below the international average in the 8th grade, and only 5 percent of U.S. eighth grade students score in the top 10 percent internationally.

THESE TESTS WILL ASSIST TEACHERS, PARENTS, STUDENTS, AND LOCAL AND STATE LEADERS. While most states assess their students in reading and math, they generally set their proficiency levels lower than the challenging levels in NAEP and currently do not have available information to compare their students' performance against other states or countries. These voluntary national tests will give parents and communities reliable benchmarks for determining how well their students are progressing toward challenging national standards. These new standard measures of excellence can help parents hold schools accountable for improved performance, can help teachers and principals improve curriculum and instruction, and can give students a guide for charting their own progress. They can identify students and schools that need extra help.

DEVELOPMENT AND ADMINISTRATION OF THESE TESTS. The new tests will be based on the widely used NAEP assessments, but will measure the performance of individual students and schools. The U.S. Department of Education will contract with independent test developers to produce the new tests, which will be available for the first time in the spring of 1999. The tests will be updated each year and released to the public after each administration. Guidance for the test development will come from the most successful math and reading teachers from across the country, parents, governors, and local and state education, civic and business leaders. Interested test publishers, states, and local school districts will be licensed to administer the tests each year. Individual test scores will not be collected by the federal government.

States and school districts can administer the tests as part of their local testing program. After each tests' administration, the entire tests (along with answers, scoring guides, and other materials) will be released to the education community. At that time, the tests along with supporting materials will be available on the Internet so that students, parents and teachers can know what is expected to reach standards of excellence in reading and math. New tests each year will keep the content of the tests current. These tests will help show who needs extra help, what changes schools need to make in teaching and the curriculum, and which schools need to be improved.

The total cost of developing the tests will be between \$10 - 12 million annually. The Department of Education intends to reimburse licensees (for example, states, school districts and testing companies) that wish to administer the new tests. The costs of administration are estimated at \$10 to \$12 per student.

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5/20/97

WHAT DO WE MEAN BY CHALLENGING MATHEMATICS?

By the end of eighth grade, students should be learning algebra, geometry, probability and estimation and using the basic skills of addition, subtraction, multiplication and division to solve problems. Students should be able to use the basics to solve more complex problems requiring multiple steps.

The items below are taken from the National Assessment of Educational Progress (NAEP, 1992) and the Third International Mathematics and Science Study (TIMSS, 1996). They illustrate the type of mathematics that 8th graders should be expected to understand and do.

1. Treena's Budget (NAEP, 1992)

This question requires you to show all work and explain your answer. Your answer should be clear enough so that another person could read it and understand your answer.

Treena won a 7-day scholarship worth \$1000 to the Pro Shot Basketball Camp. Round-trip expenses to the camp are \$335 by air or \$125 by train. At the camp she must choose between a week of individual instruction at \$60 per day or a week of group instruction at \$40 per day. Treena's food and other expenses are fixed at \$45 per day. If she does not plan to spend any money other than scholarship, what are all choices of travel and instruction plans that she could afford to make? Explain your reasoning.

Mathematics Tested

This question requires students to understand the meaning of numbers in context and use everyday logic to develop the choices Treena has for travel and instruction plans within her budget. Students must also determine what arithmetic processes to use to determine the cost of each choice and then to use basic arithmetic to compare the total cost for each alternative, compare the costs to her total budget, and determine how many choices fit her budget.

Identifying relevant numerical information and then using it in multi-step problem-solving is essential to real life activities such as creating a family budget or a small business plan.

U.S. eighth-grade students have difficulty with multi-step problems. They often use a single-step approach which yields an incorrect answer. This use of single-step strategies may be due to a less-than-thoughtful approach to problem-solving, an inability to deal with more than one condition in a context, or poorly developed reading skills.

Answer

A correct solution to this question shows what the three possible options are and includes supporting work for each option. See solution on the following page.

National Results

Percentage of students able to identify all 3 correct budget options: 2%
Percentage of students able to identify 1 or 2 correct budget options: 17%
Percentage of students able to identify no correct budget options: 81%

Treena's Budget: The correct solution indicates what the three possible options are and includes supporting work for each option.

~~$$\begin{array}{r}
 1000 \\
 - 335 \\
 \hline
 665 \\
 - 420 \\
 \hline
 245 \\
 - 315 \\
 \hline
 \text{---}
 \end{array}$$~~

$$\begin{array}{r}
 1. \quad 1000 \\
 - 335 \\
 \hline
 665 \\
 - 280 \\
 \hline
 385 \\
 - 315 \\
 \hline
 70
 \end{array}$$

$$\begin{array}{r}
 40 \\
 \times 7 \\
 \hline
 280
 \end{array}$$

$$\begin{array}{r}
 2. \quad 1000 \\
 - 125 \\
 \hline
 875 \\
 - 280 \\
 \hline
 595 \\
 - 315 \\
 \hline
 280
 \end{array}$$

$$\begin{array}{r}
 3. \quad 1000 \\
 - 125 \\
 \hline
 875 \\
 - 420 \\
 \hline
 455 \\
 - 315 \\
 \hline
 140
 \end{array}$$

1. take air, group, food
2. train, group, food
3. train, individual, food

National Percent - 2%

2. Area of a Rectangle (TIMSS, 1996)

The length of a rectangle is 6 cm and its perimeter is 16 cm. What is the area of the rectangle in square centimeters?

Answer: _____

Mathematics Tested

This geometry problem requires students to understand the properties of rectangles and the important concepts of perimeter and area. These fundamental concepts of geometry and measurement are skills needed by all citizens for everyday tasks such as home improvements as well as for a wide variety of careers such as carpentry, architecture and engineering. The problem also requires students to do two step problem-solving: first finding the width of the rectangle from the information given and then determining the area of the rectangle from its length and width.

Answer

The area of the rectangle is 12 square centimeters.

International Results

Singapore:	86%
Korea:	66%
Japan:	65%
International Average:	40%
U.S.:	22%

3. Sue and Peter's Purchase (TIMSS, 1996)

Peter bought 70 items and Sue bought 90 items. Each item cost the same and the items cost \$800 altogether. How much did Sue pay?

Answer: _____

Mathematics Tested

This question requires students to understand and apply fundamental concepts of algebra and proportionality in multi-step problem-solving. The use of proportional thinking and algebra to represent situations involving quantity and to solve for unknown variables is critical to tasks as diverse as choosing personal financial investment strategies (e.g., how to apportion between investments) and ensuring the correct dosage and ingredients when mixing or dispensing medicines in a pharmacy.

Answer

Sue paid \$450 for the 90 items.

International Results

Singapore:	83%
Japan:	71%
Korea:	62%
International Average:	38%
U.S.:	23%

1ST STORY of Level 1 printed in FULL format.

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March 26, 1997, Wednesday, Final Edition

SECTION: METRO; Pg. B01

LENGTH: 233 words

HEADLINE: The Problem With The Post's Math Problem

BODY:

Hoping to explain Virginia's new standardized school tests, The Washington Post printed a few sample questions yesterday. All went well until we tried to render an 11th-grade algebra equation.

Algebra is a distant memory for the editors and reporters involved. We failed to notice that in reprinting the equation, we left out a "squared" symbol.

This caused great frustration among a number of readers who apparently like nothing more than a few algebra problems with their morning cereal. At least 60 called to point out that something was terribly wrong. By midday, some of the callers said they had involved the entire staffs of leading law firms and engineering enterprises in trying to solve the problem.

"We were going crazy," said Tom DeFranco, an aviation consulting engineer in McLean.

Virginia Lt. Gov. Donald S. Beyer Jr., a Phi Beta Kappa in economics, said he worked at it at his breakfast table and decided it was solvable only "if you applied quantum mechanics and could move backwards in time."

Here is how the question should have read:

The velocity v , in meters per second, of a projectile fired into water is given by:

$$v = 150 + t - t(\text{squared})/5$$

where t is time in seconds. After how many seconds is the velocity of the projectile equal to 0?

The four answers listed with the multiple-choice question are 25, 30, 50 and 75. The correct answer is 30.

LANGUAGE: ENGLISH

LOAD-DATE: March 26, 1997

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL

of pages ▶ 1

To Bill	From Misc
Dept./Agency	Phone #
Fax # 456-7028	Fax #



NSN 7540-01-317-7368

5002-101

GENERAL SERVICES ADMINISTRATION

FAX

BOSTON COLLEGE

Center for the Study of Testing, Evaluation, and Educational Policy

To: Clarence Miller - National Testing Office

Fax#: 202-219-1466

From: Eugenio J. Gonzalez - Research Associate

Date: May 19, 1997

What follows are the percents correct for 8th graders in Japan, Korea, Singapore and the United States on a set of selected items from the Third International Mathematics and Science Study. Please note that item U02 was not administered in Singapore and Japan, and item N17 was not administered in Japan. Let me know if you have any questions.

Country	Item I08
Japan	47
Korea	42
Singapore	59
United States	41

Country	Item I09
Japan	87
Korea	83
Singapore	92
United States	68

Country	Item K05
Japan	65
Korea	66
Singapore	86
United States	22

Country	Item K07
Japan	74
Korea	81
Singapore	92
United States	63

Country	Item K08
Japan	69
Korea	66
Singapore	69
United States	17

Country	Item L14
Japan	49
Korea	41
Singapore	47
United States	20

Country	Item N17
Korea	50
Singapore	70
United States	34

Country	Item O01
Japan	75
Korea	67
Singapore	67
United States	72

Country	Item Q01
Japan	57
Korea	64
Singapore	86
United States	49

Country	Item Q04
Japan	88
Korea	77
Singapore	93
United States	88

Country	Item R08
Japan	75
Korea	56
Singapore	49
United States	54

Country	Item R14
Japan	71
Korea	62
Singapore	83
United States	23

Country	Item S02A	Item S02B	Item S02C
Japan	89	52	56
Korea	74	48	41
Singapore	96	90	67
United States	57	15	15

Country	Item U01A	Item U01B
Japan	78	59
Korea	58	56
Singapore	70	71
United States	47	45

Country	Item U02A	Item U02B
Korea	54	39
United States	18	10

OPTIONAL FORM 99 (7-94)

FAX TRANSMITTAL

1 of pages 2

To	From
Dept. Agency	Phone #
Fax #	Fax #

To: *Bill Kargand*
 Dept. Agency: *WHT DPC*
 Fax #: *456-7028*

GENERAL SERVICES ADMINISTRATION
5039-101
NSN 7540-01-317-7386

17. A car has a fuel tank that holds 35 L of fuel. The car consumes 7.5 L of fuel for each 100 km driven. A trip of 250 km was started with a full tank of fuel. How much fuel remained in the tank at the end of the trip?

- A. 16.25 L *4.27 gallons*
 B. 17.65 L *4.62 "*
 C. 18.75 L *4.92 "*
 D. 23.75 L *6.23 "*

35 L $\approx$ 9.19 gallons

7.5 L $\approx$ 1.97 gallons

100 km $\approx$ 61.6 miles

250 km $\approx$ 153.9 miles

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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 Number Sense	Solving Problems	39%	35%	611

A car has a fuel tank that holds 15 gallons of fuel. The car consumes 5 gallons of fuel for every 100 miles driven. A trip of 250 miles was started with a full tank of fuel. How much fuel remained in the tank at the end of the trip?

A. 2.5 gallons

B. 12.5 gallons

C. 17.5 gallons

D. 5.0 gallons



UNITED STATES DEPARTMENT OF EDUCATION
OFFICE OF THE ASSISTANT SECRETARY
FOR EDUCATIONAL RESEARCH AND IMPROVEMENT

FAX COVER SHEET

DATE: May 19

TIME: 10:10

TO: Bill Kincaid

FAX#: 456 7028

FROM: M. [signature]

Number of pages including fax cover: _____

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Special Comments:

These are the ones we discussed of Jody -
For POTUS - consider: K-5, K-7, O-1, Q-4, R-8, S-2, U-2
For Press packet consider: I-8, I-9, K-8, K-14, N-17, Q-1, R-14
We are getting US statistics on all U-1

18. A straight line on a graph passes through the points (3,2) and (4,4). Which of these points also lies on the line?

A. (1,1)

B. (2,4)

C. (5,6)

D. (6,3)

E. (6,5)

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	

- I9. In a bag of cards $\frac{1}{6}$ are green, $\frac{1}{12}$ are yellow, $\frac{1}{2}$ are white and $\frac{1}{4}$ are blue. If someone takes a card from the bag without looking, which color is it most likely to be?

- A. White
- B. Blue
- C. Green
- D. Yellow

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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,	Using Complex	67%	60%	490

- K5. The length of a rectangle is 6 cm, and its perimeter is 16 cm. What is the area of the rectangle in square centimeters?

K-5

Answer: _____

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	NCX1 2300	Measurement	Solving Problems	40%	32%	613

K7. A drawer contains 28 pens; some white, some blue, some red, and some gray. If the probability of selecting a blue pen is $\frac{2}{7}$, how many blue pens are in the drawer?

K-7

A. 4

B. 6

C. 8

D. 10

E. 20

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
		Data Representation		60%	48%	550

K8. These triangles are congruent. The measures of some of the sides and angles of the triangles are shown.

What is the value of x ?

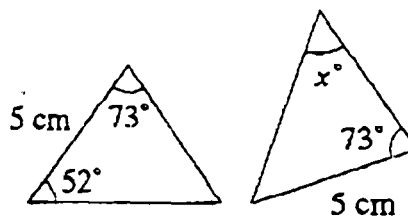
A. 52

B. 55

C. 65

D. 73

E. 75



K-8

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	B	Geometry	Performing Routine Procedures	35%	27%	639

L14. The table shows the values of x and y , where x is proportional to y .

x	3	6	P
y	7	Q	35

What are the values of P and Q ?

- A. $P = 14$ and $Q = 31$
- B. $P = 10$ and $Q = 14$
- C. $P = 10$ and $Q = 31$
- D. $P = 14$ and $Q = 15$
- E. $P = 15$ and $Q = 14$

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	

N17. A car has a fuel tank that holds 35 L of fuel. The car consumes 7.5 L of fuel for each 100 km driven. A trip of 250 km was started with a full tank of fuel. How much fuel remained in the tank at the end of the trip?

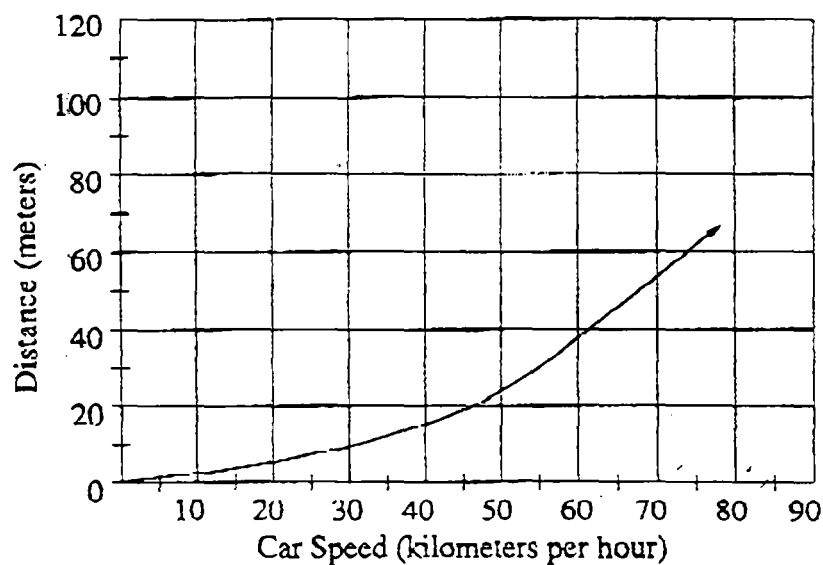
- A. 16.25 L
- B. 17.65 L
- C. 18.75 L
- D. 23.75 L

N-1

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	

- O1. The graph shows the distance traveled before coming to a stop after the brakes are applied for a typical car traveling at different speeds.



A car traveling on a highway stopped 30 m after the brakes were applied. About how fast was the car traveling?

- A. 48 km per hour
- B. 55 km per hour
- C. 70 km per hour
- D. 160 km per hour

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	

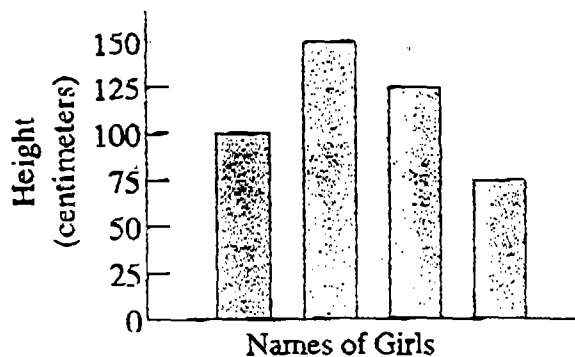
Q1. Juan has 5 fewer hats than Maria, and Clarissa has 3 times as many hats as Juan. If Maria has n hats, which of these represents the number of hats that Clarissa has?

- A. $5 - 3n$
- B. $3n$
- C. $n - 5$
- D. $3n - 5$
- E. $3(n - 5)$

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly	International Difficulty Index
				Upper Grade, Lower Grade	

Q4. The graph shows the heights of four girls.



The names are missing from the graph. Debbie is the tallest. Amy is the shortest. Dawn is taller than Sarah. How tall is Sarah?

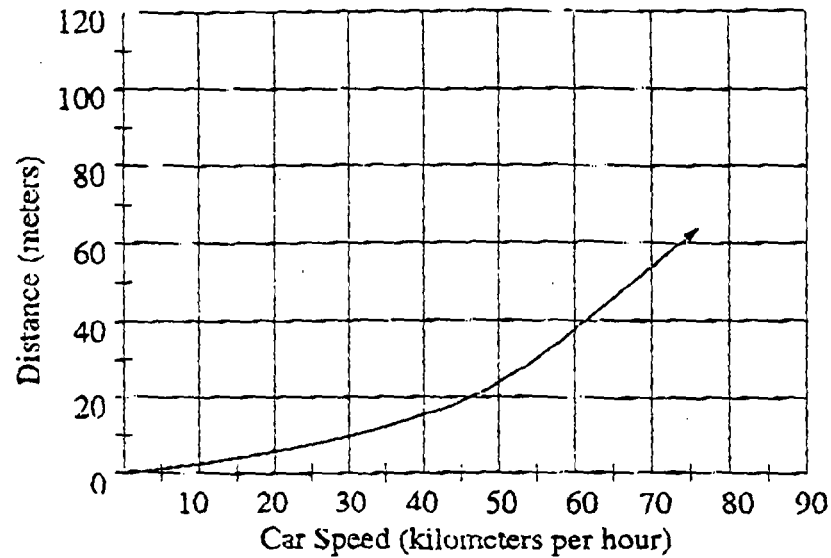
- A. 75 cm
- B. 100 cm
- C. 125 cm
- D. 150 cm

Q-4

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics		Using Complex		22%	21%	376

- R8. The graph shows the distance traveled before coming to a stop after the brakes are applied for a typical car traveling at different speeds.



A car is traveling 80 km per hour. About how far will the car travel after the brakes are applied?

- A. 60 m
- B. 70 m
- C. 85 m
- D. 100 m

R-8

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
				49%	44%	565

R14. Peter bought 70 items and Sue bought 90 items. Each item cost the same and the items cost \$800 altogether. How much did Sue pay?

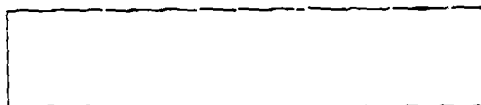
Answer: Sue paid _____

R-14

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	next page	Proportionality	Solving Problems	38%	32%	617

- S2. The figure consists of 5 squares of equal size. The area of the whole figure is 405 cm^2 .



Find the area of one square.

Answer _____ square centimeters

Find the length of the side of one square.

Answer _____ centimeters

Find the perimeter of the whole figure in centimeters

Answer _____ centimeters

S-2a

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Part A

Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
				49%	53%	499

- U1. Teresa wants to record 5 songs on tape. The length of time each song plays for is shown in the table.

Song	Amount of Time
1	2 minutes 41 seconds
2	3 minutes 10 seconds
3	2 minutes 51 seconds
4	3 minutes
5	3 minutes 32 seconds

ESTIMATE to the nearest minute the total time taken for all five songs to play and explain how this estimate was made.

Estimate: _____

Explain:

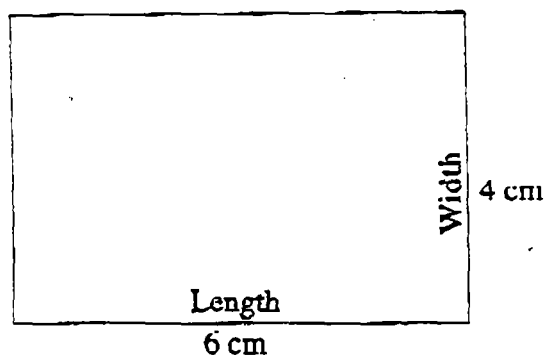
U-1a

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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	Fractions and Number	Solving Problems	35%	31%	631

U2.



- a. In the space below, draw a new rectangle whose length is one and one half times the length of the rectangle above, and whose width is half the width of the rectangle above. Show the length and width of the new rectangle in centimeters on the figure.

- b. What is the ratio of the area of the new rectangle to the area of the first one?

Show your work.

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U-2a

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	Measurement	Solving Problems	31%	24%	621

OPTIONAL FORM 99 (7-99)

FAX TRANSMITTAL

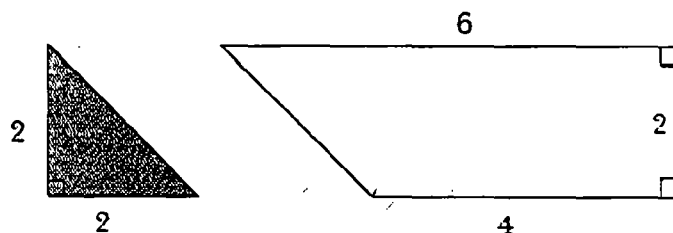
of pages **5**

To Bill Kincaid	From WSSA
Dept./Agency WA	Phone 219 1966
Fax # 456-7028	Fax #

NSN 7540-01-517-7368 5099-101 GENERAL SERVICES ADMINISTRATION

NT TO EXAMINE STUDENT ACHIEVEMENT

TIMSS found that the content of U.S. mathematics classes is not as advanced as in the top-performing countries, and this is reinforced by the achievement results. When the concepts were more specialized, such as in measurement and geometry, U.S. eighth-grade students had particular difficulty. For example, Items 4 and 5 required understanding of important concepts in perimeter and area and of the properties of rectangles and triangles. Item 6 indicates that students also may have insufficient understanding of some concepts in analytic geometry.



How many triangles of the shape and size of the shaded triangle can the trapezoid above be divided into?

- A. Three
- B. Four
- ☒ C. Five
- D. Six

Item 5

Singapore	75
Korea	81
Japan	84
U.S.	44

% correct

Item 6

Singapore	59
Korea	42
Japan	47
U.S.	41

% correct

A straight line on a graph passes through the points (3,2) and (4,4). Which of these points also lies on the line?

- A. (1,1)
- B. (2,4)
- ☒ C. (5,6)
- D. (6,3)
- E. (6,5)

ACHIEVING EXCELLENCE: TIMSS AS A STARTING POINT TO EXAMINE STUDENT ACHIEVEMENT

7

The numbers in the sequence 2, 7, 12, 17, 22, ... increase by fives. The numbers in the sequence 3, 10, 17, 24, 31, ... increase by sevens. The number 17 occurs in both sequences. If the two sequences are continued, what is the next number that will be seen in both sequences?

22, 27, 32, 38
31, 38 ←

Answer: 38

Item 7

Singapore	62
Korea	64
Japan	60
U.S.	42 % correct

8

Juan has 5 fewer hats than Maria, and Clarissa has 3 times as many hats as Juan. If Maria has n hats, which of these represents the number of hats that Clarissa has?

- A. $5 - 3n$
- B. $3n$
- C. $n - 5$
- D. $3n - 5$
- ☒ E. $3(n - 5)$

Item 8

Singapore	86
Korea	64
Japan	57
U.S.	49 % correct

The importance of extending and creating patterns is stressed in the NCTM *Curriculum and Evaluation Standards for School Mathematics*¹ (see *TIMSS as a Starting Point to Examine Teaching* for excerpts of the NCTM Standards). The results on several TIMSS items, including Item 7, suggest that U.S. eighth graders could use more emphasis in this area.

Students also had difficulty with more traditional algebra items such as those that required simplifying, evaluating, and writing expressions. For example, about half the U.S. students were not successful in identifying the correct expression to represent the number of Clarissa's hats (Item 8).

¹ National Council of Teachers of Mathematics. *Curriculum and Evaluation Standards for School Mathematics*. Reston, VA: National Council of Teachers of Mathematics, 1989.

ACHIEVING EXCELLENCE: TIMSS AS A STARTING POINT TO EXAMINE STUDENT ACHIEVEMENT

An algebraic equation with an unknown variable could have been used to solve Item 9, although only about 10 percent of the U.S. eighth graders used this approach. Most students used basic operations, but were unsuccessful in providing a correct solution. Regardless of the approach used, just 25 percent of the U.S. eighth graders answered this item correctly compared with 71 percent of those in Singapore.

There are 54 kilograms of apples in two boxes. The second box of apples weighs 12 kilograms more than the first. How many kilograms of apples are in each box? Show your work.

$$\begin{array}{r} 27 \\ 25 \overline{)54} \end{array}$$

$$\begin{array}{r} \textcircled{1} \quad \textcircled{2} \\ 21 \quad 33 \end{array}$$

$$\begin{array}{r} 27 \\ + 6 \\ \hline 33 \end{array} \quad \begin{array}{r} 27 \\ - 6 \\ \hline 21 \end{array}$$

Item 9

Singapore	71
Korea	43
Japan	54
U.S.	25

% correct

Percent of Students Using Equation

Singapore	35
Korea	29
Japan	29
U.S.	10

ACHIEVING EXCELLENCE: TIMSS AS A STARTING POINT TO EXAMINE STUDENT ACHIEVEMENT

10

Peter bought 70 items and Sue bought 90 items. Each item cost the same and the items cost \$800 altogether. How much did Sue pay?

Answer: _____

450

Items 10, 11, and 12 illustrate a range of TIMSS items involving proportionality. All were very difficult for U.S. eighth graders, highlighting the need for further work on this important kind of mathematical reasoning.

Item 10

Singapore	83
Korea	62
Japan	71
U.S.	24

% correct

11

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

x	3	6	P
y	7	Q	35

What are the values of P and Q ?

- A. $P = 14$ and $Q = 31$
- B. $P = 10$ and $Q = 14$
- C. $P = 10$ and $Q = 31$
- D. $P = 14$ and $Q = 31$
- ☒ E. $P = 15$ and $Q = 14$

Item 11

Singapore	47
Korea	41
Japan	49
U.S.	20

% correct

ACHIEVING EXCELLENCE: TIMSS AS A STARTING POINT TO EXAMINE STUDENT ACHIEVEMENT

Item 12-a

Singapore	47
Korea	39
Japan	41
U.S.	15

% correct

Item 12-b

Singapore	21
Korea	14
Japan	17
U.S.	6

% correct

Two boxes of square-shaped cardboard pieces are available to make a larger pattern. There are 4 small squares in each piece.

All pieces in Box 1 look like



All pieces in Box 2 look like



In the required pattern, for every piece from Box 2 there are 2 pieces from Box 1.

- (a) If 60 pieces from Box 2 are used in the required pattern, how many pieces will be needed altogether?

Answer: 180

- (b) What fraction of the small squares in the required pattern will be black?

Answer: 1/3

Taken separately and together, the TIMSS items can reveal considerable information about students' understanding of mathematics and their ability to engage in mathematical reasoning across various content areas. How would students in your state, district, school, and classroom perform on these items?

8th Grade Math Problem

8

Juan has 5 fewer hats than Maria, and Clarissa has 3 times as many hats as Juan. If Maria has n hats, which of these represents the number of hats that Clarissa has?

A. $5 - 3n$

B. $3n$

C. $n - 5$

D. $3n - 5$

☒ E. $3(n - 5)$

8th Grade Math Success: International Results

Percentage of students answering correctly:

Singapore = 86%

Korea = 64%

Japan = 57%

U.s. = 49%

Draft May 15, 1997

TOWN HALL MEETING

(Actual boards in bold; talking points in regular type)

**POTUS OUTLINING IMPORTANCE OF EXAMPLE OF CHALLENGING STUDENTS
IN READING AND MATH**

Board 1: What do we know about student learning? Students and schools will raise to the high expectations and standards we set for them. Our students must master the basics to get ahead.

- Strong schools with clear standards of achievement and discipline are essential to our children and our society.
- These standards are needed to help instill the skills, fundamental American values, and hard work that our children need to get on the right track.
- Toward that end we must establish meaningful standards for what the students should be expected to learn and achieve in the basics and core subjects.

Board 2: Where do we start? Reading well and independently by the end of grade 3/start of grade 4 is the most basic national standard, and mastering math including algebra by the end of grade 8 is essential to get on the right course.

- If you don't know where you are trying to go, it is hard to get there. This is true if you are driving a car, building a house, or running a small business, or reading well, or mastering math. To succeed, you need to know of what success looks like so you know how to work to get there. The same is true in education. If parents and students and teachers don't know where they are headed --what they agree students should know and be able to do --it is hard to all pull together to get there.
- Students know this. 70% of high school students say that they would pay more attention to school work and learn more if standards were raised and consistently enforced. (Public Agenda)
- Parents know this. 60% of Americans say that standards are too low in their own local school. (Public Agenda)
- Two critical areas are reading and math. Every child should read independently by the end of third grade/start of fourth grade. Every child should master challenging mathematics, including the essentials of algebra and some geometry, by the end of 8th grade.

Board 3: How do we know if we are meeting our standards? The best way for parents and teachers to know how their students are doing is to check themselves against what is expected. The widely regarded National Assessment of Educational Progress tests at grade 4 in reading and grade 8 in math demonstrate what we should expect of our students.

- Tests can help us know how we are doing in these basics. Parents will know how their child is performing, not only in relation to other students in their school--but to students around the nation and around the world.
- Tests can be given as "check ups" at critical turning points in students' academic careers--4th grade in reading and 8th grade in math.
- Need to read independently by the end of third grade/start of fourth grade in order to read to learn other subjects--history, science--in the later grades. Students who read well early are more likely to stay in school and do well than those who do not.
- Need to master challenging mathematics by end of 8th grade in order to take the required math and science courses students in high school need to go on to college and be employable for high paying jobs.

Board 4: Read passages [*Charlotte's Web*--See attachment "A"]

Board 5: A fourth grade student reading at the:

"Basic" level can recognize most words on the page, understand the question being asked and identify important information.

"Proficient" level can quickly recognize words, summarize a passage, pick out specific information, describe the way the author presented the information.

"Advanced" level can do everything a proficient reader can and also can provide much more information than is needed to just answer questions about what has been read.

Board 6: (note: if board 6, may not need board 5)

107. Basic: keeps her word, patient, confident

W — Proficient: Charlotte works hard to keep her word. At the beginning of the paragraph she made a promise to Wilbur and by the end of the paragraph she figured out how to do it. Charlotte was going to play a trick on Zuckerman.

12 — Advanced: Charlotte was a loyal friend who kept her word. She was also very clever. In this paragraph Charlotte thinks about how she can keep her promise to save Wilbur's life by tricking Zuckerman. Her idea her the small spider a way to outsmart Zuckerman who is much larger than she is.

- A "basic" answer is a solid answer that virtually every child should be able to do. For this great passage from Charlotte's Web, one question you might want to ask a 4th grader is this:

Based on this paragraph how would you describe Charlotte to a friend? Include Evidence from the passage to support your description (note: other possible questions Attachment "C").

A student at the basic level would be able to list characteristics that are described in the paragraph. For example they might say that any of the following traits described Charlotte: keeps her word, patient, confident, cunning, clever, smart

A student at the proficient level would list one or more of those characteristics and make references to a particular sentence in the passage. For example, they might write:

Charlotte works hard to keep her word. At the beginning of the paragraph she made a promise to Wilbur and by the end of the paragraph she figured out how to do it. Charlotte was going to play a trick on Zuckerman.

A student at the advance level would include more than one trait, and associated explanations. For example, they might write:

Charlotte was a loyal friend who kept her word. She was also very clever. In this paragraph Charlotte thinks about how she can keep her promise to save Wilbur's life by tricking Zuckerman. Her Idea gives her the small spider a way to outsmart Zuckerman who is much larger than she is.

Of our fourth graders, almost 40% are below basic. That means that they can not read this passage and have a solid understanding of it. They can't do that basic

answer I described. And, only about 39% of all our students perform at the proficient level or above.

[add 1-2 brief points on importance of reading well]

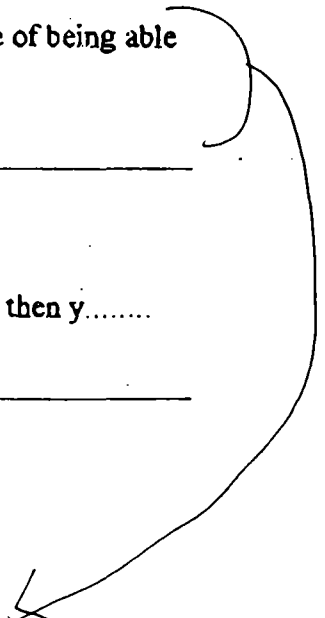
Board 7: Mathematics item [to be chosen; sample are in Attachment "B"]

- To be able to answer this question, a student has to understand x , and then has to think through a couple of steps--first he has to x , then he/she has to y and he/she has to put it together in.....
 - (depending on the question chosen, give explanation of importance of being able to do multi-step problems, represent data, etc.....)
-

Board 8: Example of student response to math question

- This student understood the question. You can see how she did x , then y
-

**Board 9: $x\%$ of U.S. students can answer this question
 $x\%$ of student in other nations can answer this question**

- [add 1-2 points on importance of mathematics]
- 

FOLLOWUP DISCUSSION WITH AUDIENCE

1. We have teachers, business people, college representatives, parents and students in the audience today.
 - a. Perhaps middle or junior high teachers could tell us why it is so important for children to read well by the end of the 3rd grade/start of fourth grade before they come to your classes?
 - b. Perhaps a student can give us an important perspective on the empowerment and importance of reading well?
 - c. Is there a high school science teacher here? Could you tell us whether students in your class need to be able to do the kind of challenging math that we talked about to be able to really do well in chemistry and physics?
 - d. What do employers need today in terms of reading, math and writing skills?
 - e. What does it take today to be accepted in colleges and to be successful in terms of reading, math and other skills?
2. It is clear reading well is absolutely essential. But how do we help children read better?
 - a. We have some teachers and principals who done some remarkable things to boost student achievement in elementary school, especially reading. What needs to be done? What works?
3. Students in many other countries perform better in 8th grade math. But our students are just as smart as students in any other country.
 - a. So, what do we need to do so that our kids do better in math? How can all of us--not just teachers--help out?
 - b. There are places that have really turned around their mathematics programs. What can we learn from them?

**FOURTH GRADE
READING ACHIEVEMENT
ATTACHMENT "A"**

The following sample passage is from *Charlotte's Web*, by E.B. White. Similar to NAEP items, it helps illustrate the kinds of skills expected of students.

Having promised Wilbur that she would save his life, she was determined to keep her promise. Charlotte was naturally patient. She knew from experience that if she waited long enough, a fly would come to her web; and she felt sure that if she thought long enough about Wilbur's problem, an idea would come to her mind. Finally, one morning toward the middle of July, the idea came. "Why how perfectly simple!" she said to herself. "The way to save Wilbur's life is to play a trick on Zuckerman. If I can fool a bug," thought Charlotte, "I can surely fool a man. People are not as smart as bugs."

Demonstrates that Charlotte
keeps her promise
to save Wilbur's life
by fooling Zuckerman.

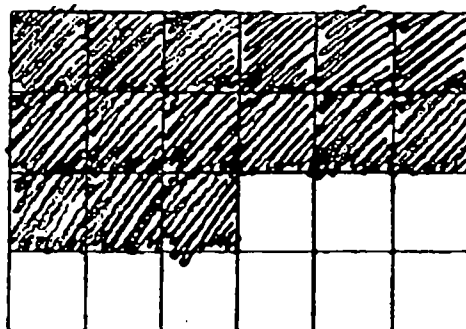
user | beginnings of a script.

Improving Thoughtful Problem-Solving in Mathematics

In this age of information and technology, society's expanding use of data makes it imperative for all citizens to have the facility to reason using quantities. It is in this area of reasoning that U.S. eighth graders often fell behind their counterparts in Singapore, Japan, and Korea.

U.S. students have a tendency to attempt to solve multi-step problems as though they involved single-step procedures. For example, in Item 1, about one-fourth of the U.S. eighth graders shaded in 5 squares, presumably because they did not account for the fact that the grid had 24 rather than 8 squares. In Item 2, the most prevalent mistake – made by one-third of the U.S. students – was to select the amount of fuel used on the trip (option C) rather than the amount of fuel remaining in the tank.

Shade in $\frac{5}{8}$ of the unit squares in the grid.



Item 1

Country	% correct
Singapore	92
Korea	81
Japan	80
U.S.	43

A car has a fuel tank that holds 35 L of fuel. The car consumes 7.5 L of fuel for each 100 km driven. A trip of 250 km was started with a full tank of fuel. How much fuel remained in the tank at the end of the trip?

- ☒ A. 16.25 L
- ☐ B. 17.65 L
- ☐ C. 18.75 L
- ☐ D. 23.75 L

Item 2

Singapore 70
Korea 50
U.S. 34 % correct
data not available for Japan

3

A rubber ball rebounds to half the height it drops. If the ball is dropped from a rooftop 18 m above the ground, what is the total distance traveled by the time it hits the ground the third time?

- A. 31.2 m
- B. 40.5 m
- ☒ C. 45 m
- D. 63 m

Item 3

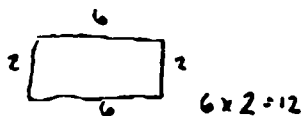
Singapore	42
Korea	36
Japan	41
U.S.	27 % correct

Item 3 was difficult for students in all the countries. Still, nearly half the U.S. eighth graders selected the distance travelled by the ball if it only travelled downward, but didn't travel back up into the air between bounces (option A).

It is unclear why U.S. students seem to use single-step strategies to solve such problems. This could be due to a less-than-thoughtful approach to solving the problems, an inability to deal with more than one condition in a context, or poorly developed reading skills. The tendency was present in items across all content areas.

4

The length of a rectangle is 6 cm, and its perimeter is 16 cm. What is the area of the rectangle in square centimeters?



Answer: 12

Item 4

Singapore	86
Korea	66
Japan	66
U.S.	22 % correct

Q5. Three-fifths of the students in a class are girls. If 5 girls and 5 boys are added to the class, which statement is true of the class?

- A. There are more girls than boys.
- B. There are the same number of girls as there are boys.
- C. There are more boys than girls.
- D. You cannot tell whether there are more girls or boys from the information given.

Q-5

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Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	A	Proportionality	Solving Problems	65%	62%	487

- U1. Teresa wants to record 5 songs on tape. The length of time each song plays for is shown in the table.

Song	Amount of Time
1	2 minutes 41 seconds
2	3 minutes 10 seconds
3	2 minutes 51 seconds
4	3 minutes
5	3 minutes 32 seconds

ESTIMATE to the nearest minute the total time taken for all five songs to play and explain how this estimate was made.

Estimate: _____

Explain:

U-1a

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Part A

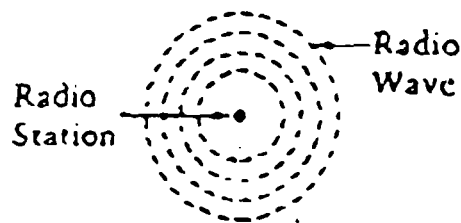
Subject	Item Key	Content Category	Performance Expectation	International Average Percent of Students Responding Correctly		International Difficulty Index
				Upper Grade	Lower Grade	
Mathematics	next page	Fractions and Number Sense	Solving Problems	35%	31%	631

NAEP 8th GRADE MEASUREMENT ITEM

This question requires you to show your work and explain your reasoning. You may use drawings, words, and numbers in your explanation. Your answer should be clear enough so that another person could read it understand you thinking. It is important that you show all your work.

Radio station KMAT in math City is 200 miles from radio station KGEO in Geometry City. Highway 7, a straight road, connects the two cities.

KMAT broadcasts can be received up to 150 miles in all directions from the station and KGEO broadcasts can be received up to 125 miles in all directions. Radio waves travel from each radio station through the air, as represented below.



On the next page, draw a diagram that shows the following.

- Highway 7
- The location of the two radio stations
- The part of High 7 where both radio stations can be received

Be sure to label distances along the highway and the length in miles of the part of the highway and where both stations can be received.

NAEP 8th GRADE NUMBERS AND OPERATIONS ITEM

This question requires you to show your work and explain your reasoning. You may use drawings, words, and numbers in your explanation. Your answer should be clear enough so that another person could read it and understand your thinking. It is important that you show all your work.

Treena won a 7-day scholarship worth \$1,000 to the Pro Shot Basketball Camp. Round-trip travel expenses to the camp are \$335 by air or \$125 by train. At the camp she must choose between a week of individual instruction at \$60 per day or a week of group instruction at \$40 per day. Treena's food and other expenses are fixed at \$45 per day. If she does not plan to spend any money other than the scholarship, what are all choices of travel and instruction plans that she could afford to make?

Explain your reasoning.

Did you use the calculator on this question?

Yes

No

ATTACHMENT "C"

Other questions that could be asked about Charlotte's Web:

There are four types of questions in NAEP. Below are examples of questions related to the excerpt from Charlotte's Web that fit into each of these categories.

Forming an Initial Understanding

Based on this paragraph how would you describe Charlotte to a friend? Include evidence from the passage to support your description.

Based on this excerpt from Charlotte's Web, how does Charlotte intend to save Wilbur's life?

Developing an interpretation

Why did Charlotte just wait until an idea came to her?

Why was it necessary for Charlotte to be patient?

Personal Reflection and Response

Describe how Charlotte compares to one of your very special friends.

In this excerpt Charlotte says, "People are not as smart as bugs." Why does Charlotte think this is the case? Why do you agree or disagree with Charlotte.

Critical Stance

Based on evidence from this excerpt from Charlotte's Web, describe at least two ways that the author makes Charlotte more than just a bug.

How does giving Charlotte a name and having her outsmart Zuckerman change the way you think about spiders?



UNITED STATES DEPARTMENT OF EDUCATION
OFFICE OF THE DEPUTY SECRETARY

FOB-10 Rm 6251

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FROM: JUDY WURTZEL

FAX: 456-7028

NUMBER OF PAGES TO FOLLOW, INCLUDING COVER SHEET: 3

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MESSAGE:

Data on Questions

FROM: KONICA FAX

TO:

MAY 19, 1997

4:01PM

P.01



FAX

BOSTON COLLEGE

Center for the Study of Testing, Evaluation, and Educational Policy

To: Clarence Miller
National Testing Office

Fax#: 202-219-1466

From: Eugenio J. Gonzalez
Research Associate

Date: May 19, 1997

Re: Data

OPTIONAL FORM 94 (7-80)

FAX TRANSMITTAL

of pages 2

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Page(s) 2
(including cover)

What follows are the percent correct for 8th graders in Japan, Korea, Singapore and the United States on a set of selected items from the Third International Mathematics and Science Study. Please note that item U02 was not administered in Singapore and Japan, and item N17 was not administered in Japan. Let me know if you have any questions.

Country	Item I08
Japan	47
Korea	42
Singapore	59
United States	41

Country	Item I09
Japan	87
Korea	83
Singapore	92
United States	88

Country	Item K05
Japan	65
Korea	68
Singapore	85
United States	22

Country	Item K07
Japan	74
Korea	81
Singapore	92
United States	53

Country	Item K08
Japan	69
Korea	68
Singapore	69
United States	17

Country	Item L14
Japan	49
Korea	41
Singapore	47

Country	Item N17
United States	20

Country	Item N17
Korea	50
Singapore	70
United States	34

Country	Item O01
Japan	75
Korea	67
Singapore	67
United States	72

Country	Item Q01
Japan	57
Korea	64
Singapore	88
United States	49

Country	Item Q04
Japan	88
Korea	77
Singapore	93
United States	88

Country	Item R08
Japan	75
Korea	50
Singapore	49

Red truck

- car speed

hats

hugut

cars

MAY-18-97 MON 16:41

FROM: KONICA FAX

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MAY 19, 1997

4:02PM

P.02

United States 64)- 208

Country Item R14
Japan 71
Korea 82
Singapore 83
United States 23

pg 00

Country Item S02A Item S02B Item S02C
Japan 89 52 58
Korea 74 48 41
Singapore 98 80 67
United States 67 15 15

- 690000

Country Item U01A Item U01B
Japan 78 59
Korea 58 66
Singapore 70 71
United States 47 45

740000

Country Item U02A Item U02B
Korea 54 39
United States 16 10