

Math Comes Alive

Toss out the flash cards, and break out the dice, blocks, and calculators—hands-on tools that make numbers meaningful.

When principal Ray Whinnem's voice comes over the public-address system every Friday morning at Martin Elementary School in Manchester, Connecticut, it's not just to recite the lunch menu or to preview next week's calendar of events. Along with the day's announcements, he presents the Math Trivia Question of the Week: What was the total number of points scored in the NFL last Sunday? How many home runs were hit in the American League last year? What percentage of Americans say their favorite color is blue?

Trivial though they may seem, these questions

form part of an innovative curriculum designed to help students become competent problem solvers in the world of mathematics. Rather than using their time simply to memorize arithmetic procedures and multiplication tables, students in the Manchester schools, from kindergarten up through sixth grade, work with tactile materials instead of textbooks; use calculators instead of standard worksheets; and engage in practical activities involving classification, geometry, logic, and probability.

Such innovations come at a critical time. Several recent studies have delivered devastating reports on the state of mathematical illiteracy in our nation's young. In a test given in 1986 by the National Assessment of Educational Progress, 54 percent of seventh graders were unable to solve a simple problem that involved finding the area of a rectangle. Another report based on the same study, last year's "The Mathematics Report Card: Are We Measuring Up?" found that half of the nation's 17-year-olds were unable to perform at a junior high level in math, and fewer than 1 in 15 could finish high school-level problems that took several steps to solve or that required algebra or geometry.

It Doesn't Compute

The blame for this poor showing is increasingly being placed on inappropriate instruction in America's classrooms. "Math is taught in a rigid, authoritarian manner," says John Allen Paulos, a professor of mathematics at Temple University in Philadelphia and the author of *Innumeracy: Mathematical Illiteracy and Its Consequences*. "There's too much emphasis on computation, as if it represented all of mathematics. If children were required to diagram sentences for 12 years, it wouldn't be a surprise if they got turned off to English." Paulos suggests that many other skills need to be taught as part of the standard math curriculum, including estimation, comparing magnitudes, interpreting graphical and statistical data, and understanding the function of numbers in everyday life.

As principal Whinnem explains, "If you look at how adults use math in their lives, 90 percent of it



involves estimation and mental computation: Do I have enough money for pizza? How far is it to the next gas station?" Yet according to a 1989 report by the Mathematical Sciences Education Board, most classroom math instruction consists not of practical problem-solving, but of lecturing by teachers and memorizing by students, the strategies found to be the least effective in promoting mathematical understanding.

"Parents need to see that real mathematics doesn't consist of arithmetic worksheets with smiley faces on them," says Marilyn Burns, author of *The I Hate Mathematics! Book*. "The ability to repeat a rote procedure is not what matters most; a calculator can do that better. What's more important is how kids use those numbers once they have a decision to make."

The real purpose of mathematics instruction, these educators say, should be to teach kids to use math in practical ways, applying logic, geometry, problem solving, probability, and measurement. And a good elementary-school math program should include manipulatives.

Learn by the Numbers

For more ideas and activities to stimulate mathematical thinking in kids, look into some of the following resources:

■ **Math Matters** (National PTA and Mathematical Sciences Education Board). This kit includes a seven-minute video, a calculator, and math activities that parents and kids can do at home using inexpensive materials. Contact your local PTA for more information.

■ **The I Hate Mathematics! Book** (by Marilyn Burns, Little, Brown; \$7.95 paperback, \$13.95 hardcover). For kids in grades four through eight, this book is loaded with practical math tricks, games, and activities. Other worthwhile books by the same author: *The Book of*

Think and Math for Smarty Pants.

■ **Family Math** (published by Equals, Lawrence Hall of Science, University of California, Berkeley, CA 94720; 415/642-1823; \$15). This book of enjoyable math activities for parents and kids to work on together is also available in Spanish. You can rent a 17-minute video showing parents and children doing math activities at home (\$25).

■ **Creative Publications** (5040 West 111th Street, Oak Lawn, IL 60453; 800/624-0822, 800/435-5843 in Illinois). This mail-order company offers a wide range of innovative math materials: manipulatives, games, puzzles, software, and books. Free catalog.

These are concrete materials such as blocks, colored rods, dice, and plastic chips of different sizes that kids can move, stack, and maneuver in order to explore mathematical relationships. In one activity at Martin Elementary School, for

instance, students use 20 one-inch-square tiles to build a rectangle four tiles wide and five tiles long. Through this hands-on activity they learn traditional arithmetic skills like multiplication and division, and they can visualize geometric concepts



Put it all behind you.

Ahhh, the wide open space. Inside. With over 60 cubic feet of cargo room the

such as perimeter and area. Whinnem points out that while many teachers use math manipulatives in the early grades, "once a child gets to a certain level, usually third grade, most teachers stop using them. Unfortunately, that's when kids need them more than ever."

Home Countdown

Hands-on math should find its way into the "living room curriculum" as well. John Allen Paulos suggests that parents ask whimsical questions to stimulate mathematical thinking: How many trees are there in the city park? How many nickels would it take to reach the top of the Empire State Building? How many hairs are there on the average human head? Using measurement, estimation, and logic, parents and kids together can work out solutions to puzzles like these.

Playing games is also an excellent way to explore mathematical ideas. "You can use mathematics in practical ways and learn about probability through such games as Monopoly," says Paulos. "If you land on Community Chest, with the next

roll of the dice are you more likely to land on Boardwalk or Luxury Tax?" (On Boardwalk; there are more combinations of the dice that total six than five.)

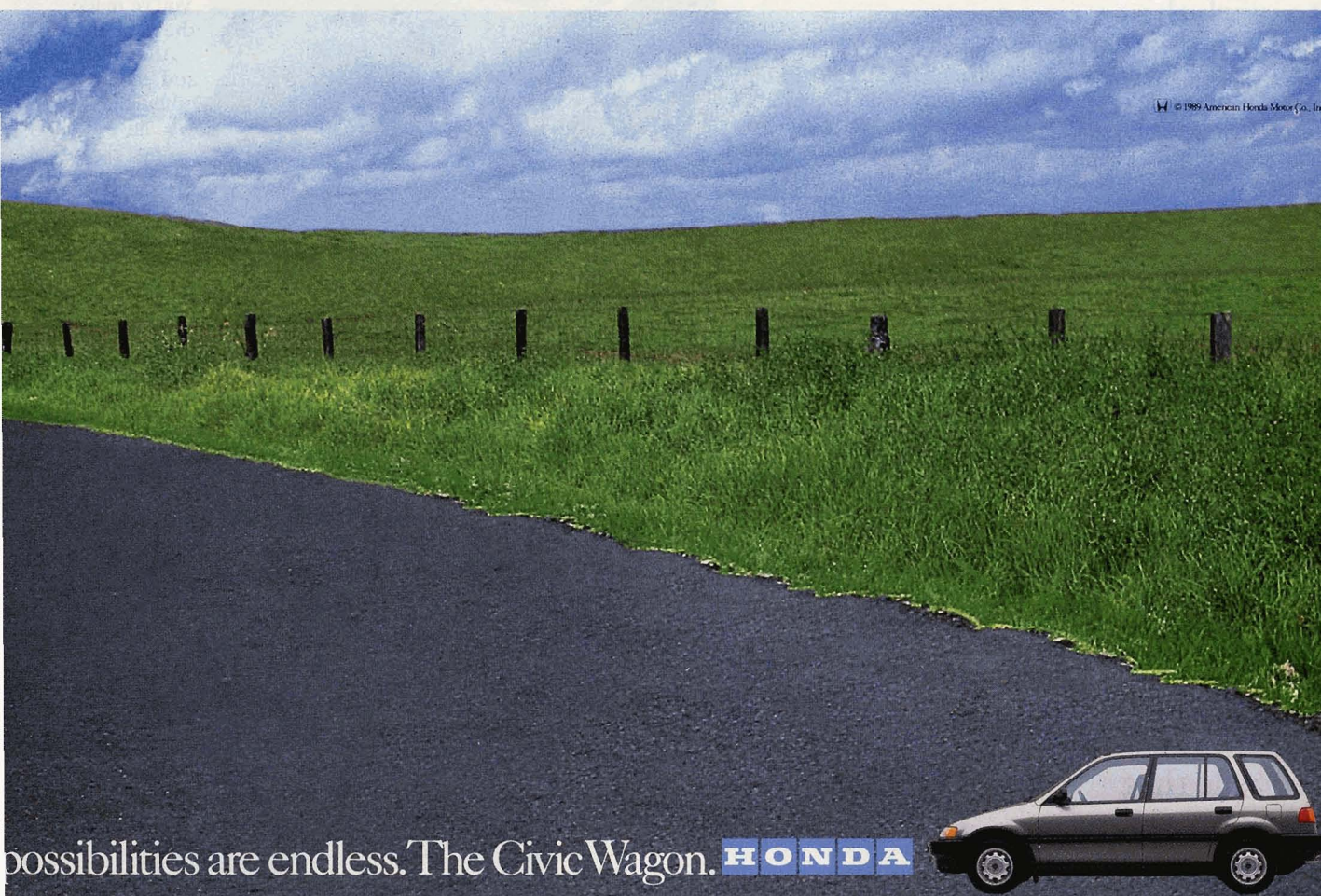
Educators say parents should not be afraid to make use of computers and calculators to stimulate their children's curiosity about numbers. Contrary to many parents' belief, kids won't become dependent on calculators and fail to progress in arithmetic. In fact, the National Council of Teachers of Mathematics endorsed the use of calculators as long ago as 1976 and recommends that every student have access to one. "A calculator is a birthright," according to Marilyn Burns. "It opens a world of numbers children wouldn't otherwise know about."

Finally, to nurture a positive attitude in their youngsters, parents should try to overcome any negative feelings or stereotypes about mathematics that they may have developed during their own school days. "Some parents have terrible memories of their own inability to function well in math: boredom, rote memorization, acres of flash cards, and 20 ques-

tions at the end of every chapter," says Ann Kahn, a consultant to the Mathematical Sciences Education Board and former national president of the PTA. By showing a genuine interest in everyday applications of math, from baseball averages and recipes to carpentry measurements and money management, parents can be models of logical thinking, and help prepare their kids for what's becoming an increasingly mathematical world.

Today, about 60 percent of the subject majors in the average university require beginning calculus, and more than 75 percent of jobs demand a knowledge of simple algebra and geometry. As Burns puts it, "Whatever challenges kids will face in mathematics in the future, they'll be different from the ones we have now." By providing a home and school environment where math counts for everybody, we can help kids get ready for the really new math that's just around the corner. □

Thomas Armstrong is the author of In Their Own Way: Discovering and Encouraging Your Child's Personal Learning Style.



possibilities are endless. The Civic Wagon. **HONDA**