

Looking for Trapezoids



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Each month I tape a half-hour program called *Great Kids, Great Families* on a local community television station. The most recent episode, called “Math Magic,” featured Teresa Foley, a teacher with a doctorate in special education and some seventeen years of experience under her belt, talking about how she helps children young and older learn about numbers.

During the show, Teresa described her clientele—not just children with panicked parents tracking their offspring’s grades but also adults working toward college degrees or preparing for licensure examinations in such fields as real estate. She brought with her various colorful props, useful because, she notes, it helps to see, feel, and do math as a hands-on activity rather than just listen to someone talk about it.

Teresa has a stash of white plastic tile spacers she buys at the local hardware or home supply store. These small gizmos are shaped like a plus sign. She trims some of them to create minuses and then uses them in batches so that children can see what it means to have a quantity and then take some of it away.

Colored poker chips can be used in the same way. The concepts of positive and negative numbers also become clearer when kids learn about balancing a bank account and dealing with overdrafts. Popsicle sticks can teach number facts and illustrate angles.

Dice help children grasp the concept of probability. “I ask a child how many sides the die has,” Teresa explains, “and then what the chances are of rolling a 6 or an even number.” Shapes cut from bright-colored paper or compressed foam show children geometry and allow them to brainstorm ways of determining, for example, the area of a trapezoid.

Not everyone recognizes a trapezoid on sight, however. All of us see what we have learned to see, in the process overlooking or discounting the rest. Teresa tells of a student who told her adamantly that he had never seen a trapezoid—“And so,” she says, “we left the classroom and traipsed all over the campus, looking for trapezoids.”

Teresa cut her teeth as a math instructor more than a decade ago when she went to teach in Kenya. Her pupils there, finding it improbable that a woman could do the job, peppered her with such questions as: “How do you know that one plus one equals two?”

“I answered as best I could,” she says. She learned from the authorities afterward that her listeners were satisfied with her expertise.

Why do American schoolchildren so often stumble when it comes to learning math? Math anxiety, Teresa and I agreed, is widespread. Sometimes performance anxiety means that a child taking a test cannot access the information that she has learned. When panic sets in, the cognitive functions shut down. In other cases, children acquire anxiety from their parents along with other basic attitudes and assumptions.

Children also take their cues from teachers in some areas. Research has shown that children’s performance improves whenever teachers regard them as possessing superior abilities. Telling a child what he is or is not good at can be a self-fulfilling prophecy.

In our time, there’s growing concern about the lack of rigor in American public school education and the ability of the rising generation to compete successfully for jobs in an increasingly global marketplace. How can we build our children’s mathematical competence?

We could start by identifying core skills: basic principles and facts, the ability to analyze a problem (so that the solution appears as a series of operational steps), and the willingness to entertain different conceptual approaches. Then we might consider ways of building these skills by means of hands-on activities. We remember what we do better than what we merely see or hear.

For all of us, learning is at its best a low-stress, low-stakes, playful process. Memorization of the multiplication tables can be turned into a game of Jeopardy—and let your child slap a bell for each correct answer. Children can play with visually appealing pattern blocks and make designs to see how circles, squares, and triangles fit together. The nineteenth-century game of Tangrams can show children how to combine shapes in familiar forms. Sophisticated players can try their hands at breaking forms down into their component parts.

The game Rush Hour, which simulates traffic jams of progressively greater complexity, is also an excellent way of building problem-solving skills. The peg game Hi-Q, a plastic version of an old English pub game, has had a whimsical incarnation into Hoppers, involving frogs on lily pads. You keep hopping until only one frog remains. This game is easier than Rush Hour and delights children as young as four or five.

Digit 24, a card game, supplies players with four numbers. In the version I have, the challenge—and there are three levels—is to use each number once; perform addition, subtraction, multiplication, and/or division; and end with the number 24. Other card games—Blink and especially Set come to mind—invite youngsters to group items that share one or more characteristics and therefore constitute a set.

Monopoly, Life, and even Sorry! require children to count, add, and subtract. Pretend bank accounts show them how to compute balances; toy cash registers with bells and lights ask users to pay up and make change. Teresa recommends that parents encourage children to budget income and expense and to estimate, for example, how long it will take to earn a coveted toy.

Long ago I watched an elementary school teacher challenge his pupils to figure out how many partridges, turtle doves, French hens, and so forth there would be if all verses of “The Twelve Days of Christmas” were sung together. You might also try filling a large jar with marbles or beans (or some combination) and inviting your children to guess how many are inside.

Before the advent of computers, televisions, and cell phones, when families more often sat down together, dinner-table conversation could promote learning and discussion—and in a way that did not further burden parents. Individual children could be challenged to research a subject and bring the newfound information back the next day. What could be easier in the age of the Internet?

In olden times, too, people might test each other’s ability to recall favorite poems. There’s no reason why today’s families can’t match wits using logic puzzles and mathematical exercises. Take a leaf from *Car Talk* on National Public Radio: give your near and dear a weekly puzzler.

Whatever games or challenges you choose to offer your family, the object is to show children how mathematics informs daily life and to encourage inventive ways of thinking. Above all, it's important to keep learning light, fun, and creative.

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