how long it took them to go through the educational system."

According to Robson, who presented her findings at the Joint Mathematics Meetings in Baltimore earlier this month, that uncertainty may be over. She analyzed the two Ashmolean multiplication tables and realized that they are signed and dated. What's more, a third tablet, housed at Yale University, is also written by Suen-apil-Urim and dated. Instead of a 24-times table, though, like the Ashmolean tablets, the Yale tablet is a 4-times table, which comes somewhat later in the Sumerian math curriculum. (Scribes learned reciprocals, too, so it's a logical progression even though it seems backward to modern eyes.) The Yale tablet not only pinned down the year the tablets were created (1815 B.C.) but also showed Robson that scribes took 6 months to progress from learning the 24-times tables to the 4-times tables. Given the natural progression of the curriculum, Robson concludes that it took about a year for Sumerian scribes to learn multiplication.

"This is a very interesting clue and very important if the extrapolation is correct," says Tinney. Although he would like to examine the tablets himself to be sure, he says he believes Robson's conclusion. Suen-apil-Urim would no doubt be pleased that, nearly 40 centuries later, his hit-or-miss struggle to master arithmetic is helping scholars get their numbers straight.

–CHARLES SEIFE

New Skating System Fails Virtual Replay

Most mathematicians would prefer a double integral to a triple axel, but mathematical missteps could trip up new rules for awarding marks for competitive figure skating. According to a team of U.S. mathematicians, the International Skating Union's new judging methods are badly flawed.

The International Skating Union proposed the changes in the wake of the scandal at the 2002 Winter Olympics, in which judges allegedly conspired to deny a Canadian figure skating team the gold medal. One key change is that the traditional panel of nine judges would be expanded to 14; five of those judges' votes would be randomly discarded. In theory, this would reduce the effectiveness of a corrupt judge or group of judges by raising the specter of their votes' not counting.

But Elyn Rykken, a mathematician at Muhlenberg College in Allentown, Pennsylvania, and colleagues at two other colleges say the method has serious defects. "It's especially unfair and capricious for the competition," she says. In computer simulations of real and fictitious skating events, Rykken and her colleagues showed that randomly tossing out five scores leads to dramatically unpredictable outcomes. In the 2002 Winter Olympics' ladies' freestyle event, for instance, American Sarah Hughes beat Russian Elena Slutskaya. But when the new rule is applied to the event (after systematically padding the judges' ranks up to 14), Rykken says, "Sarah Hughes comes in first about one-quarter of the time, while Elena Slutskaya comes in first three-quarters of the time." An ideal judging method, she says, would yield an identical outcome for identical sets of judges' scores.

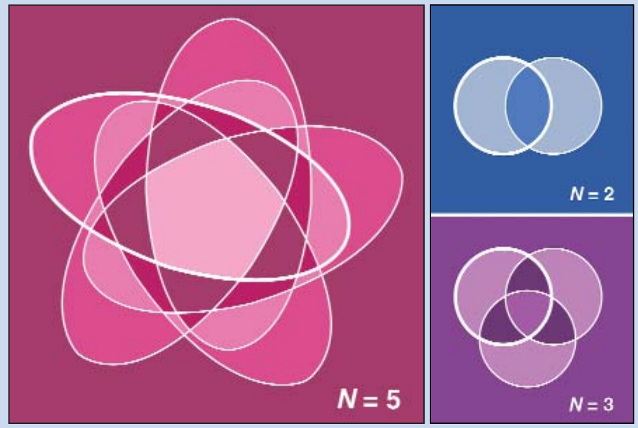
"I understand that point of view," says Roland Jack, the communications coordinator for the Lausanne, Switzerland–based International Skating Union. The new system might not be perfect, Jack acknowledged, but he noted that the same judges are eliminated throughout the whole skating program to make it as consistent as possible.

–CHARLES SEIFE

Diagram Masters Cry 'Venn-i, Vidi, Vici'

Some things are so simple you'd think they'd have nothing new to offer. Take Venn diagrams. A staple of high school algebra, these diagrams use overlapping geometric shapes—usually circles—to represent the different ways two or three sets can intersect. What more is there to say?

A lot, it turns out. Three mathematicians, including an undergraduate student, recently solved a 3-decade-old problem involving rotationally symmetric Venn diagrams. Imagine making such a Venn diagram with a rubber stamp, moving the stamp evenly around a circle N times. The result would look like a daisy with N petals overlapping at the center. The hard part is finding a petal shape that will result in all possible combinations of intersections. For which numbers of sets (or petals), mathematicians wondered, can such rotationally symmetric diagrams be drawn? Only prime numbers work, they quickly realized, but which ones? Now Carla Savage and Charles "Chip" Killian of North Carolina State University in Raleigh and Jerrold Griggs of the University of South Carolina, Columbia, have found a way to draw a diagram for any prime number of sets, no matter how large.



Whorled without end. Rotationally symmetric Venn diagrams form an infinite series.

Until 2 years ago, rotationally symmetric diagrams were known for only the first few primes. The familiar circular Venn diagrams with two and three sets fit the bill. There are many examples with five sets, including one made by rotating an ellipse (see figure), and many more with seven, although they were so hard to find that mathematicians initially doubted their existence. Two years ago, Peter Hamburger of Indiana University–Purdue University in Fort Wayne constructed an example for $N = 11$.

It looked as though mathematicians might be in for an eternity solving the problem prime by prime. Fortunately, the new result takes care of everything at once. At a workshop* held in Baltimore a few days before the joint math meetings, Savage and colleagues described a systematic way of producing rotationally symmetric Venn diagrams of arbitrarily large (prime) size. Their proof, which produces snowflakelike patterns that Hamburger calls "doilies," builds on a suggestion Hamburger made after constructing his $N = 11$ example. "We didn't have to do many new things," Savage says. "When all the pieces were put together, it required only one new trick": a clever way of ordering the intersections around the circle, which she credits to her then-student Killian (now a grad student at Duke University).

"The solution is very elegant," says Lenore Cowen of Tufts University in Medford, Massachusetts. Frank Ruskey of the University of Victoria, Canada, whose Web site survey of Venn diagrams (sue.csc.uvic.ca/~cos/venn) has become a touchstone for researchers interested in the subject, agrees. "It's nice to have it finally resolved," he says.

The Carolina trio's result is not the last word on Venn diagrams, though. Their construction produces points where many curves come together. Partly for aesthetic reasons, but mostly for a new challenge, mathematicians now want to know if they can find rotationally symmetric diagrams with curves that meet only in pairs. Examples are known with two, three, five, and seven sets, but whether that continues for larger primes—even 11—remains to be seen.

–BARRY CIPRA

* ALICE03 (Algorithms for Listing, Counting, and Enumeration), 11 January; sponsored by the Society for Industrial and Applied Mathematics.

CREDIT: (LEFT) BASED ON DIAGRAM BY FRANK RUSKEY/UNIVERSITY OF VICTORIA, BRITISH COLUMBIA