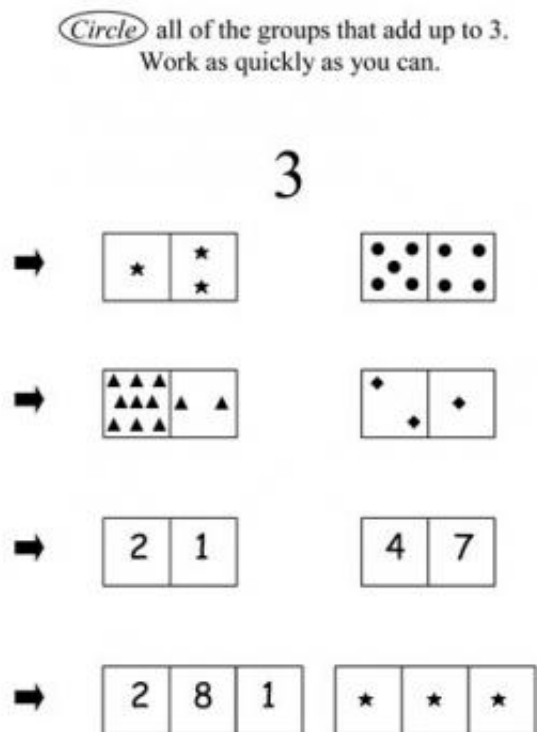


# Early number sense plays role in later math skills

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This image provided by the University of Missouri shows an illustration part of a University of Missouri study that examined first-graders' "number system knowledge." That's how well they understand such things as that numbers represent quantities. Youngsters who didn't have a good grasp of these concepts went on to have lower scores on a key math skills test years later when they were in seventh grade. We know a lot about how babies learn to talk, and youngsters learn to read. Now scientists are unraveling the earliest building blocks of math -- and what children know about numbers as they begin first grade seems to play a big role in how well they do everyday calculations later on. (AP

Photo/University of Missouri)

We know a lot about how babies learn to talk, and youngsters learn to read. Now scientists are unraveling the earliest building blocks of math—and what children know about numbers as they begin first grade seems to play a big role in how well they do everyday calculations later on.

The findings have specialists considering steps that parents might take to spur [math abilities](#), just like they do to try to raise a good reader.

This isn't only about trying to improve the nation's [math scores](#) and attract kids to become engineers. It's far more basic.

Consider: How rapidly can you calculate a tip? Do the fractions to double a recipe? Know how many coins the cashier should hand back as your change?

About 1 in 5 adults in the U.S. lacks the math competence expected of a middle-schooler, meaning they have trouble with those ordinary tasks and aren't qualified for many of today's jobs.

"It's not just, can you do well in school? It's how well can you do in your life," says Dr. Kathy Mann Koepke of the National Institutes of Health, which is funding much of this research into math cognition. "We are in the midst of math all the time."

A new study shows trouble can start early.

University of Missouri researchers tested 180 seventh-graders. Those who lagged behind their peers in a test of core [math skills](#) needed to

function as adults were the same kids who'd had the least [number sense](#) or fluency way back when they started first grade.

"The gap they started with, they don't close it," says Dr. David Geary, a [cognitive psychologist](#) who leads the study that is tracking children from kindergarten to high school in the Columbia, Missouri, school system. "They're not catching up" to the kids who started ahead.

If [first grade](#) sounds pretty young to be predicting math ability, well, no one expects tots to be scribbling sums. But this number sense, or what Geary more precisely terms "number system knowledge," turns out to be a fundamental skill that students continually build on, much more than the simple ability to count.

What's involved? Understanding that numbers represent different quantities—that three dots is the same as the numeral "3" or the word "three." Grasping magnitude—that 23 is bigger than 17. Getting the concept that numbers can be broken into parts—that 5 is the same as 2 and 3, or 4 and 1. Showing on a number line that the difference between 10 and 12 is the same as the difference between 20 and 22.

Factors such as IQ and attention span didn't explain why some first-graders did better than others. Now Geary is studying if something that youngsters learn in preschool offers an advantage.

There's other evidence that math matters early in life. Numerous studies with young babies and a variety of animals show that a related ability—to estimate numbers without counting—is intuitive, sort of hard-wired in the brain, says Mann Koepke, of NIH's National Institute of Child Health and Human Development. That's the ability that lets you choose the shortest grocery check-out line at a glance, or that guides a bird to the bush with the most berries.

Number system knowledge is more sophisticated, and the Missouri study shows children who start elementary school without those concepts "seem to struggle enormously," says Mann Koepke, who wasn't part of that research.

While schools tend to focus on math problems around third grade, and math learning disabilities often are diagnosed by fifth grade, the new findings suggest "the need to intervene is much earlier than we ever used to think," she adds.

Exactly how to intervene still is being studied, sure to be a topic when NIH brings experts together this spring to assess what's known about math cognition.

But Geary sees a strong parallel with reading. Scientists have long known that preschoolers who know the names of letters and can better distinguish what sounds those letters make go on to read more easily. So parents today are advised to read to their children from birth, and many youngsters' books use rhyming to focus on sounds.

Likewise for math, "kids need to know number words" early on, he says.

NIH's Mann Koepke agrees, and offers some tips:

—Don't teach your toddler to count solely by reciting numbers. Attach numbers to a noun—"Here are five crayons: One crayon, two crayons..." or say "I need to buy two yogurts" as you pick them from the store shelf—so they'll absorb the quantity concept.

—Talk about distance: How many steps to your ball? The swing is farther away; it takes more steps.

—Describe shapes: The ellipse is round like a circle but flatter.

—As they grow, show children how [math](#) is part of daily life, as you make change, or measure ingredients, or decide how soon to leave for a destination 10 miles away,

"We should be talking to our children about magnitude, numbers, distance, shapes as soon as they're born," she contends. "More than likely, this is a positive influence on their brain function."

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